HOW TO STUDY IN COLLEGE

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BY

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PREFACE

This book has been written to help solve a very acute problem in American secondary schools, colleges, and universities. While it is intended primarily for college students, certain parts of it may be used with equal profit in high schools. The first five chapters apply specifically to college students, but the last seven chapters will apply to both college and high school students.

The book does not pretend to solve the study problem in college. When the student reaches college his study habits and attitudes are pretty well established. All that a book of this sort can hope for is to set before the student certain principles and ideals of study and show him how they may be put into practice. The extent to which they are practiced is left entirely with the student.

Furthermore, it is not expected that all students will attempt to put in effect all the suggestions and hints given in this book. Some students come to college with a good study technique already acquired; such persons will find the first chapters most helpful. Other students may have lived during their high school days in a college town; to these the last eight

chapters will be perhaps the most helpful. The book attempts to cover the entire field with the hope that all students will find in it certain useful suggestions. Naturally some paragraphs, and even some chapters, may seem obvious, trite, and even commonplace to some students; but these same parts may be the most helpful to others.

The book is the product of three years' experience with college freshmen. Many of the suggestions and principles are derived from actual problems which certain freshmen have presented. In addition to this practical experience, the book includes many of the more important facts and suggestions contained in other books and articles on this general subject.

The author acknowledges his indebtedness to the above freshmen and to the writers on this subject, and to all others who have cooperated in this enterprise. He is especially indebted to his wife, Ruby Patton May, who besides reading the manuscript has given constant cooperation and encouragement; and to his colleague, Mr. E. F. Bradford, who has read the manuscript and suggested many important changes.

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How to Study in College

Chapter I

WHAT IS INVOLVED IN HOW TO STUDY

Learning How to Study. College students ought to know how to study but many of them do not. This is the almost universal opinion of college teachers. When the average high school student arrives at college, he is confronted with a new environment, both physical and mental. Even though he knew how to study in high school, it does not follow that he will know the most effective methods in college. It is true that some of the study habits acquired in high school will be valuable in college, but on the whole, the entire scheme of things must be reorganized. So one of the first things a freshman must learn is how to study in college. Let us first see what it involves.

(1) College Study Involves Many Adjustments. In a certain sense, learning how to study in college is simply a matter of making the proper adjustments to the college environment. This involves not alone

adjustment to the intellectual environment, such as the laboratory, the shop, the classroom, and the library, it includes adjustment to the physical and social environment. How to study in college is a matter of finding a place to study, a time to study, and study companions, as well as acquiring a technique of study.

Mental Machinery Like All Other Requires Adjustment. In a limited way, the human mind is like a machine. In order to get the highest efficiency and greatest endurance out of a complicated piece of machinery, constant care and attention is needed. A smooth-running and efficient automobile, for example, must be looked after and kept in repair and adjustment. The carburetor must be adjusted, especially when the machine is changed from one climate or altitude to another. If the mixture of air and gasoline is too rich, the engine overheats, misses fire, and runs unevenly; if the mixture is too lean, it backfires, and does other inefficient tricks. The energy or fuel that drives the mind is likewise a mixture of many things. If this mixture is out of proportion, the student "misses fire" or "backfires," sputters, overheats and loses power. The freshman must keep his mental carburetor adjusted if he expects to make the "grade" on high. The

brakes of the car must also be adjusted occasionally. If the brakes are bad, accidents and sometimes wrecks result. Many a freshman has gone into the ditch because his mental brakes needed adjusting. To carry the analogy still further, the clutch needs attention. When the clutch slips the engine runs fast but the car scarcely moves. Precisely the same thing happens to freshmen. The mental and bodily engine races at top speed but nothing is accomplished, — the energy is wasted.

A great number of adjustments must be made on the mental machinery of the college student who runs in the race for the Bachelor's degree. If these adjustments are to be made at the right time and place, the student must understand his mental machinery thoroughly and know how to keep it in first class running order.

(2) Getting Started Right. Many an athletic contest is won or lost at the start rather than at the finish. Football games are often won in the first minute of play; track races are won or lost sometimes on the very start. Battles are won before they begin. The freshman who gets a good start in the first few weeks of college has done much to win success. Statistics show that college students who survive the first half year have good chances for

graduation. At the end of the first semester most of the inefficient students are weeded out. The number dropped at the end of the first semester varies from year to year and from college to college. It usually runs from five to twenty-five per cent. The average is around ten per cent. This means that ten out of every hundred freshmen are dropped from college after a period of 16 weeks. Statistically a good start in college means to be numbered among the 90 who stay.

A right start in college means further a start where you left off in high school. Most freshmen courses are built on the assumption that those who take them have a certain foundation laid in high school. Indeed, the particular course that you take in Latin, or French, or Mathematics, or Science, depends on the courses that you had in high school. If your high school preparation is poor, you are handicapped at the beginning. The student who did solid work in high school has the advantage over you. One reason often given for failure in the first year of college is inadequate preparation. The conclusion to be drawn is that if you did poor work in a certain subject in high school, do not try to continue this subject in college until you have laid a more secure foundation.

Start with proper adjustments. A good start in college involves the making of numerous adjustments to your new environment. A college president with many years of experience says: "This first year is one of adjustment. You are to get your bearings and find the true point of perspective, to discover yourself. . . . You will find less of the letter and more of the spirit, less of the memoritor work and more of the comprehension and positive assimilation, less of the recitation and more of discussion, less of the single text and more of the collateral reading, less mechanism and more life. Your work will be more difficult, but will be more enjoyable; your road will be somewhat rougher, but the journey will bring more pleasure; your effort will be more wearing, but the achievement will repay in far greater proportion. This is a year in which you are to establish precedents and to fix habits. If you go about your work systematically, in an orderly way, with definite movement, you will not depart from these methods later in life. If you are loose, disjointed, and slack-twisted, and permit yourself to become mentally frayed-at-the-edges, the chances are against your ever pulling yourself together and going about any task in a really masterful way. Start right, then, with accuracy and promptness and snap

and vim, and every day of your life will find you moving more easily and more surely and more successfully. Dawdle, and shuffle, and evade, and whine, and your fate is sealed. Long before you have reached even middle life, you will have been cast into the human scrap heap — worthless."

The freshman year is truly the key year. Examine the college records of a few graduates and you will find that the honor students, the Phi Beta Kappa men and women, make high marks in their freshman year. The author quoted above goes on to explain this: "It is especially true that college work of the last three years is peculiarly dependent upon the thoroughness and accuracy of the work of the first year. If your freshman mathematics are treated carelessly, you will go deeper in the mathematical mire each term and each year thereafter; and while you may possibly secure the 'pass' in the mathematics of the general course, you will lose all the mental training and mental development peculiar to this study, and you will become totally unfitted for any technical work whatever. If the details of construction in language work are slighted and slurred, you will never acquire that ease and freedom of movement which alone assures the enjoyment that comes from companionship with the best spirits of

the past. . . . If the beginnings of science are not mastered, you may be sure that you will not acquire the habit of accurate investigation, that unwillingness to be content with vague and general statements as to "more or less," that insistence upon knowing whether it is more or less and exactly how much more or how much less, which are very essential to all lasting success under present world conditions. If you would be happy and care-free in your later course, start right."

(3) **The Right Frame of Mind.** The attitude that you take toward your studies is a determining factor in your college success. The one who started the saying, "Don't let your studies interfere with your college education," probably meant it as a joke, but many freshmen take it seriously. It is a very expressive phrase and states precisely the attitude that leads to defeat and humiliation. Freshmen who take the attitude that intellectual work is merely one of the necessary evils of college life imposed solely for the sake of interfering with their good times, will wake up before many weeks to find that studies were greater evils than they thought. From this point of view they are the demons that start you on the road to failure, not only in college but also in life.

Put your Studies First. Before you have been long in college you will find many things competing for your interest and your time. The longer you stay the greater the competition will be. There will be clubs, fraternities, athletics, socials, parties, trips, and college activities of all sorts clamoring for a slice of your time. Sooner or later you will have to make up your mind which to put first. Indeed, you may have to arrange these things in the order of their importance to you and apportion your time among them accordingly. To some you will devote much time and energy, others you will neglect altogether. If you do not make this decision consciously you will make it unconsciously and possibly irrationally. Things will get in first that you know ought to come last; things will be crowded out that ought to be in. The aim of a book like this is to insure your studies of their right and proper place — the first place, all the time. The assumption is that you are in college primarily to get an education. Activities of a certain kind do contribute to this end. But the main factor is your intellectual work.

A totally wrong attitude toward studies is fostered by popular prejudice against the college grind. You will soon hear it said that a grind is very unpopular and that a person who makes all "As"

is not fit for anything else. You will also be told that "C" is a gentleman's grade. It has happened that bright students have allowed their work to drag because they were afraid of making too many high grades and thereby becoming unpopular. If you will take the trouble to look up the grades of those upper classmen who spread this vicious propaganda you will find that they are merely skinning through. Their talk is excuse for their indolence and ignorance. Nine cases out of ten it is "sour grapes" against those who have the brains and industry to do well in their work. President Lowell of Harvard says that A or E is a real gentleman's grade because he either does his best or nothing at all.

There is, of course, another side to the argument. The right attitude is not studies exclusive of everything else but studies above everything. There is a slight danger of becoming a bookworm, although few freshmen ever get the disease. Not all of your education comes from books and courses, much of it comes from other things. President Hyde of Bowdoin College in addressing the freshmen says: "Put your studies first; and that for three reasons: First, you will have a better time in college. Hard work is a necessary background for the enjoyment of everything else. Second, after the first three months

you will stand better with your fellows. At first there will appear cheaper roads to distinction but their cheapness is soon found out. Scholarship alone will not give the highest standing with your fellows; but you will not get their high respect without showing that you can do well in something that is intellectually difficult. Third, your future career depends on it. On a little card, five by eight inches, every grade you get is recorded. Four or eight years hence, when you are looking for business or professional openings, that record will, to some extent, determine your start in life. But you are making a more permanent record than that upon the card; you are writing in the nerve cells and films of your brain habits of accuracy, thoroughness, order, power, or their opposites; and twenty, thirty, forty years hence that record will make or mar your success in whatever you undertake."

(4) The Discovery of Intellectual Problems. The intellectual path of the freshman is not bordered with roses. Each day he will encounter new difficulties which he will be unable to surmount with or without help. Along the highways of the country are numerous signs indicating danger points. Anyone who has traveled the main trails is familiar with such signs as "Stop, Danger Ahead!" or "Caution,

Drive with Care!" or "Sharp Left Curve." In somewhat the same manner the road the college student must travel should be posted.

One of the first problems of the freshman is to know what is expected of him. Back in high school he knew pretty well what he was expected to do in the way of class work. College requires a higher grade of work and requires it in different ways. All freshmen know that they are expected to register for their course, pay their bills, buy their books and attend class. Beyond this, they know little of what is expected of them. In some courses it is made very plain what is required, in other courses the requirements are vague and hazy.

The Problems of College Freedom. A whole battery of problems arise from the amount of freedom in college compared with that in high school. There you did most of your studying in a study room with an instructor watching you. You studied at prescribed hours and along with a group of others. How different it is in college! No study hall, no set hours for study, no study supervisor. As far as time and place of study is concerned you are your own boss. In this liberty lies the danger. If you are not very careful you will put off studying until you have little time to spare. Then you will hurry

and half do it, or go up with a bad lesson. When your time is all your own, except for 15 or 16 hours each week when you are in class, there is a tendency to spend it unwisely. Moreover, after a few years under the high school system when your time was scheduled out for you, it is hard for you to know what to do with it. The choice of how to use your time lies entirely with you. The freshman year, especially the first part of it, is a season of many decisions. You can choose the good or the bad, the bitter or the sweet; you can rise or fall, sink or swim. A Dean of a large American university said: "College is the easiest place in the world to rise to the heights or go to the devil."

The Problems of Competition. Intellectual competition in college is keener than it is in high school. This is especially noticeable to students who come from small high schools. Back in the village you may have stood at the head of your class; you may have carried off the honors and worn all the badges of distinction. You were a big frog in a small pond. But when you come to college it is not so easy as it was in high school. There are other frogs as big as you and bigger too. Here you are competing with students who also stood at the head in a bigger and better class than yours. It is a common observation

that students who win honors in high school often drop low, and even fail entirely in college. This is not always the case; it is not even usually so, but it does happen once in a while. One reason why it happens is that a student may be the best in his class in high school and still not be much of a scholar. The grade of "A" in high school may be equivalent to a grade of "C" in college, although this is not necessarily true. In college the grading is more or less relative, especially in large freshman courses. The best students get "A," the next best get "B" and the poorest get "E." There are always some "As" given in each course, more "Bs," a lot of "Cs," some "Ds" and a few "Es." The number who obtain each grade varies from year to year and course to course. But the point is, to get an "A," you must be among the *best;* to be among the best you must compete with the rest of the class.

The Problems of Interest. Other intellectual problems grow out of the range of interest in your subjects. There will be some subjects that you will like, some you will be neutral toward, others you may despise. The problem becomes acute when you find that in college you are required to take certain subjects that you avoided taking in high school because you did not like them. Suppose, for example,

that you dislike laboratory work. You did not take science in high school. When you come to college you will find that the freshman requirements are so arranged that you will be compelled to take certain subjects because you did not have them in high school. If you did not take science in high school, then you have to take it in college. This means that some of your freshman subjects you will not like. It is sometimes pathetic to see the expression of sadness and gloom come over the face of a freshman when he is told that he must take a subject which he avoided in high school. So the chances are that many freshmen are taking one or more courses that they dislike. What can be done about it? The only way out is to work up a liking for these distasteful things. The way to do this will be pointed out later.

The Problems of the Lecture Method. College offers fewer textbook courses and more laboratory, discussion, and lecture courses than high schools. Freshmen often find it difficult to adjust themselves to lecture courses. If you have never worked under the lecture method you will have to learn the tricks of listening and note taking. Colleges require more library work and more collateral reading; colleges offer more opportunity for first hand and personal

investigation of problems. All these things will be discussed in due time.

(5) The Technique of Study. Studying is an art which very few master. It is much more than merely reading books or preparing lessons. In his classic book on "How to Study," McMurray says: "The work that is necessary in the assimilation of ideas" is study. Studying is regarded as the kind of mental work done by students. This is its broader aspect. In a narrower sense studying is preparing lessons and assignments. This is what is meant here by the "technique" of study.

The method of study used on any occasion depends in part on the kind of material that is to be learned and in part on the technique acquired by the student. There are, nevertheless, certain fundamental principles that underlie all forms of study. It is obvious that English Literature requires a different study technique from mathematics but they both require concentration of attention.

Here we shall recognize five different types of study technique. First, the reading type in which studying is merely a matter of reading assignments; second, the memory type in which study is a process of memorizing certain material; third, collecting and organizing information, such as laboratory and

note-book work; fourth, the problem-solving type as found in mathematics and logic; and fifth, the drill type in which studying is a matter of practice. Any subject which a college student is required to study may involve one or all of these types.

Summary. How to study in college is a broad problem embracing adjustments to physical and social environment; getting started right; establishing the right mental attitude; the discovery of intellectual problems; and acquiring the technique of study.

Most of what follows in this book is a discussion of the principles and technique of study. But before these can be adequately considered, we must first define the objectives of the college student, and second analyze his motives for study or for reaching these objectives.

Chapter II

FACTORS IN COLLEGE SUCCESS

What is College Success? Strictly speaking success in college is excelling in those things that college students do. It is coming out on top. And yet it is hardly as simple as this, for there are degrees of success. The individual who comes out ahead is the *most* successful of the group; the persons who follow are only less successful. The failures are those who fall so low that they are out of the running entirely.

Success in college is measured in two ways. First, in terms of hours passed and grades obtained; second, in terms of participation in the so-called "activities." According to the first anyone is successful who graduates, and the most successful is the one who stands at the head of the class. The marks or labels of this sort of success are membership in the honorary societies, such as Phi Beta Kappa, or commencement honors. According to the second measure the most successful individual is the one who participates in the greatest number of activities,

or who is the greatest athlete, or the most successful manager, or the president of the most societies; in short, the one who has done most to spread the fame and name of his Alma Mater. Indeed, it is a tradition in many institutions to award the highest student office to the senior who has received the greatest amount of publicity.

Neither of these views of success is entirely right and neither is entirely wrong. There is, perhaps, a happy medium between them or a happy combination of them, that will yield the best results. As we have already indicated, the freshman is not asked to choose between "studies" and "activities," but is asked to decide which he will put first. As a matter of fact, neither of these is a measure of success but rather a sign or symptom of it. The real standards of success in college are two: first, an education; and second, a successful life. Consider these separately beginning with the second one.

Success in College Measured by Success in After Life. Out of every class of college graduates some fail in life, some succeed and others have varying degrees of success or failure. The question of what those who succeed in life did in college is an interesting one. It is a question of what factors of college life contribute most to success in later life. A few

years ago there was a widespread opinion especially among business men that a college education was a positive hindrance to success in business. Fortunately this attitude is gradually passing away with the passing of those business men who never went to college and were thus prejudiced against it. This prejudice, however, was not altogether ill-founded. There are indeed certain college graduates who will never amount to a row of pins. They were doomed failures before they started to college.

But what is success in after life? This has been variously measured or estimated. Sometimes it is a matter of financial gain, though this is not a safe criterion. It may mean good citizenship. The leading citizen of the town or community is often a college man. Or it may mean contributions to civilization. Great books, great inventions, and discoveries are made by educated people.

Scholarship in College is the best Criterion of Success. Statistical studies have been made of large numbers of college graduates. The outcome of all these studies is that the honor student has the greatest chance for success in life. Furthermore, one's likelihood of success is proportional to his scholarship. Some years ago, a statistical study was made of 1667 graduates of Wesleyan University. The

results were as follows: Out of 140 high honor men, valedictorians or salutatorians of their classes, 50% achieved sufficient distinction in the world to entitle them to inclusion in "Who's Who"; of 461 Phi Beta Kappa men, 31% won distinction entitling them to a place in "Who's Who"; out of the remaining 1206 only 9% won this distinction. The author of this study says: "We are justified in assuming that, for this college at least, the chances of distinction for a high honor graduate, one of the two or three leading scholars of the class, are just even; that one out of three of those elected to Phi Beta Kappa is likely to achieve pronounced success in life; and that each of the remaining members of the class has less than one chance in ten to become famous. In other words, roughly speaking, the quarter (or fifth) of the class elected to Phi Beta Kappa are likely to supply just as many distinguished men as are the remaining three-quarters (now four-fifths) of the class."

President Lowell of Harvard made an interesting study of the relationship between college work and success in post-graduate professional schools. The following table taken from Hollingworth's *Vocational Psychology* is significant. It pertains to Lowell's investigation.

Record in College		*Number awarded "Cum Laude" in Law*	
Plain degree	609	40	6.6%
Cum Laude	305	68	22.3%
Magna Cum Laude	200	80	40.0%
Summa Cum Laude	33	20	60.0%

		Number awarded "Cum Laude" in Medicine	
Plain degree	239	86	36.0%
Cum Laude	85	65	76.5%
Magna Cum Laude	39	34	87.2%
Summa Cum Laude	2	2	100.0%

Similar studies have been made of the relationship between earning capacity in after life and college grades. These all show that those who stand highest in their classes also, on the average, earn the best salaries or make the most money in later life.

From the above statements and figures it is evident that your success in life depends somewhat upon your degree of scholarship in college. The higher you stand in your class work the greater are your chances of distinction, of success in professional schools, and of a high salary.

College Success in Terms of Education. If by success in college we mean a college education it is necessary to define education very specifically. Who is the educated man? What are the marks of an education? How do you recognize it when you see

it? Is it measured in terms of academic degrees or commencement honors? Not necessarily. The B.A. degree does not spell education; it stands for "Bachelor of Arts," and all bachelors are not educated. Indeed, a person may have the major portion of the alphabet strung after his name and still be uneducated. Is it measured in terms of activities? Not to any great extent. The athlete, the editor, the actor, the class officer, the manager, and all the rest may be passing their work and still missing an education. There are a variety of views concerning what education is and how to become educated. Without attempting to expound the philosophy of education we can get at a simplified but clear conception of it. In order to make it as practical as possible let us enumerate some of the things that a freshman may reasonably expect to get out of college.

What You May Expect to Get Out of College.

(1) *You will get a certain fund of information;* some of it you will retain, much you will forget. Some of it will be practical, much of it you will never use. Why spend your time then acquiring facts and information that you will forget as soon as the examination is over? There are two reasons for this. First, there are many facts which have a prac-

tical value but you do not know it. That is, their value is indirect. The fact that you see no immediate use for Chemistry or Latin is no proof that it will not be useful some day. It is true that education consists more in what you can do than in what you know. But how can you *do* unless you *know?* Your facts may be no good as ends in themselves but as means to further ends they may be extremely useful. The student who complains that a course is impractical is much like a builder who would say: "What's the use of laying a foundation for my store? I cannot use the foundation to store or display my goods. It has no practical value to me, therefore, I will erect my building without a foundation." This is essentially the fallacy committed by students who refuse to study a course because it has no practical value *that they can see.*

A second reason for acquiring facts that have no apparent utility is that information is essential to thinking. You will hear it said that the aim of college education is to teach you to think and use your mind, not to supply you with information. This is true. But how can you think in a vacuum? You cannot think unless you have something to think about. Information is essential to all mental operations.

Of course, you cannot remember everything you learn in your courses; you cannot hope to assimilate all the knowledge in your text books. You will have to discriminate, and select. The preliminary selection has been made for you. The freshman requirements provide a certain distribution over the entire field of knowledge. In each and every course there are certain fundamental facts and principles that you must learn whether they appear practical or not.

During the past two or three years certain information tests have been given college graduates. These tests all reveal an astounding shortage of information. Edison, who invented an information test, and miscalled it an intelligence test, found that college men and women are woefully ignorant about some of the common things of life. Mr. Edison's criticism of college students was answered by statements to the effect that colleges and universities are not "filling stations" along the highways of life, and that it is not their purpose to make walking encyclopedias out of their graduates. This is all very true and well taken. Nevertheless, the fact remains that college men and women do not have the funds of knowledge that they should have to cope with the problems of life.

(2) *You Should Develop Mental Power.* Mental power comes first from information and second from a knowledge of how to use your mind. In order to get along in the world there are certain mental acts that must be performed. The first is thinking. Thinking is really solving problems. The college graduate who cannot think out a problem of the practical sort cannot be said to have an education. The ability to think and reason is required in nearly all college courses, but there are certain ones that specialize in this field. These are the courses in mathematics and logic. The aim of freshman mathematics is not the mastery of formulae or the manipulation of symbols, but to get the student into the habit of thinking. The same is true of logic.

Another thing the college student should learn is the trick of continued concentration. This applies particularly to reading. Most college graduates cannot read. That is, they cannot get the full meaning from a page of print especially if it is a bit technical. In addition to the thinking and concentration are other things such as memory, judgment, power of observation, and determination.

Again, warning should be given against assuming that this is all there is to a college education. Edu-

cation does not consist wholly in acquiring information, neither does it consist wholly in developing mental powers. An old theory of education had it that education is a process of developing the various faculties of the mind. It was assumed that the mind is composed of many little minds or faculties, as they were called, such as memory, concentration, judgment, reasoning, will-power and the like. All that one has to do is to take these faculties one at a time and expand or stretch it or somehow make it grow and the sum-total result is an education. Modern psychology denies this. The mind works as a unit and is used as a unit in dealing with life's problems.

(3) *You Should Get Culture and Refinement.* Culture is a vague term because it has many meanings It may mean a kind of priggishness or snobbery which is not desirable. It may mean civilization in some high form. Here it means appreciation. College is a place where you learn to appreciate the better things of life. And by "better" is meant the more permanent and more abiding. Classical music is better than jazz because it gives a more substantial and abiding pleasure. You soon tire of the popular songs and tunes but you never tire of the classics. This is why they are

classics; if people had tired of them, they would have been discarded long ago.

An eminent writer on education says: "Appreciation is bound up with four different types of situations which are of most importance to the teacher — (1) appreciation of the beautiful, (2) appreciation of human nature, (3) appreciation of the humorous, (4) appreciation of intellectual powers."

College offers a fine opportunity to acquire good tastes for music, literature, and other arts. If you do not like good poetry now, four years from now you ought to enjoy reading it; if you prefer jazz to good music today, when you graduate you should have acquired a liking for the best. In short, college is a place where your tastes may undergo a decided change and where life should grow richer and more abundant.

Appreciation of human nature means a sympathetic understanding of the values of life. To get along in a world made up of human beings it is necessary to understand their moods and feelings, their trials and virtues, their hopes and sorrows. Education tends sometimes to become cold and colorless. There is a "warmth and intimacy" in the coldest biological fact and the most irregular Greek verb provided you have the power to appreciate it.

The emotional side of education is highly important and often overlooked.

Much has been said about the sense of humor. It is a happy virtue which is partly native and partly acquired. There are all grades and degrees of humor. Your ideas of what is funny or witty change as you become more educated. The things that you may laugh at today may seem pitiful or disgusting tomorow. In this respect a college student may rise or fall. If he indulges in trading cheap jokes or reciting shady stories his sense of humor degenerates; if he seeks the higher and keener wit found in humorous books he will rise to a higher plane of mirth.

The appreciation of intellectual powers means the taste for high types of mental work. An artistic and highly skilled workman despises a botched job. The man of genius is never satisfied with a half-baked idea. Students are very likely to drop into the slovenly habit of being satisfied with the first meaning a sentence suggests; or being satisfied with the answer to the problem without any real knowledge of the principle; or being content with an essay that is unworthy of the name. Education makes you discontented with the grade of mental work you

used to do and makes you desire and appreciate the higher types.

The Value of Appreciation. "The value of feelings of appreciation are threefold: First, they serve as recreation. It is in enjoyment of this kind that most of the leisure of civilized races is spent. . . . Second, they are impersonal. They are valuable in that they take us out of ourselves, away from self-interests, and therefore make for mental health and sanity as well as for a sympathetic character. They are also a means of broadening one's experience. Third, they have a close relationship with ideals and therefore have an active bearing on conduct. . . . If an individual truly appreciates, enjoys, beautiful pictures, good music and books, he will be likely, so far as he can, to surround himself with them."

These values come from the study of all subjects, — but literature is the most helpful. "When we ask ourselves why a knowledge of literature seems indispensable to the ordinary idea of civilization," writes Dr. Eliot of Harvard, "we find no answer except this — that in literature are portrayed all human passions, desires, aspirations, and that acquaintance with these human feelings, and with the

means of portraying them, seems to us essential to culture." In the same essay Dr. Eliot goes on to say: "This recognition of science as pure knowledge, and of the scientific method as the universal method of inquiry, is the great addition made by the nineteenth century to the idea of culture." Literature, science, and history are the three main sources from which the college student derives culture.

(4) *You Should Get Higher Ideals and Greater Ambition.* When you graduate you may have knowledge, mental power, and culture and still be uneducated. Another change must take place. Your ideals and ambitions must change. The chief aim of education is to improve and satisfy human wants. You must want better things and know how to get them. The things you now want most you will soon find that you do not want at all. Now you may want social standing, athletic valor, prestige, etc., later you may not want any of these things. You will get rid of your irrational wants, superstitions will vanish and your childhood fancies will be forgotten. Whereas your wants now may be selfish and personal, then they will be impersonal and unselfish. All this points to the fact that a college education implies a strong moral character and a deep religious motive.

(5) *You Will Find Your Place in the World.* Nothing is more pathetic than to see the college graduate walk out from his alma mater with his diploma under his arm not knowing whither he is bound. The man or woman who goes through four years of college and receives a degree and then goes out into the world to take the first job that "looks good" cannot be said to have a complete education. Choosing a vocation is more complicated than it looks; it requires much more than saying to yourself "I think I should like law or medicine or teaching or business." In college you should gradually grow into the thing you will do in life. In all this you will need counsel and advice. Your courses may help you but they will not decide the matter for you. A decision on your life's work comes in various ways. Some of you already know, most of you think you know. Begin early to think the matter over; be on the lookout for signs that will point the way you should travel.

Summary. Success in college equals an education. Education means the following:

1. The acquisition of a certain amount of information.
2. The development of good mental habits especially habits of study.

3. Increased appreciation of the best things in the world and increased enjoyment from them.
4. A change in ideals and purposes; a new and better scale of values.
5. A definite decision on your life's work.

Chapter III

MOTIVES FOR GOING TO COLLEGE AND FOR STUDY

The Different Motives and Their Importance. Motives are the most important factors in achieving success. Whether or not you accomplish the five elements of an education outlined in the last chapter is dependent largely upon the motives and purposes that prompted you to come to college. Your study problems grow out of and are conditioned by your motives.

The reasons why men and women go to college are many and varied. There are perhaps as many reasons as there are persons. However, it is possible to classify or group the motives under a few simple headings. It is assumed that you know why you are in college. The purpose of the following is to help you define your own motives and if necessary change them.

Those Who Go and Those Who are Sent. In the first place we might divide college students into two great classes. Those who go to college and those

who are sent. There is a big difference in the attitude of these two classes of students toward their work. The first class are in college because they feel the need of an education, or because they wish social standing, or because they wish to earn a comfortable living. In short, they have a defined purpose or set of purposes. The student who is sent to college is usually the son or daughter of wealthy or well-to-do parents. The parents possibly realize the need for education and the son or daughter does not. There is a great difference in the study problems of these two classes.

This division, however, is not quite fair because there are many honest and hard-working students who have been sent to college. Of course, the purpose of the division is to distinguish those who really desired to go from those who who are sent against their will. But the number of students who are here because they were compelled to come are few. If you came to college unwillingly, desiring rather to do something else, you had better plan to get away as soon as possible. Most of us can remember back in our childhood days when we just hated to go to school. Then we would make all sorts of excuses, play hookey, anything to escape going to school. But now we trust that these childish things

have been put away and that every freshman here really desires to go to college, so much so that it would be a great disappointment to leave.

Some Go to College to Increase Their Earning Power. One very common motive for going to college is to increase your earning capacity. There are statistics abundant to show that college men and women command better salaries than individuals with a high school education. Taking large numbers and getting an average it will be found that up to a certain limit, the more years you spend in school the greater is your earning power. There are those who will tell you that a college man and woman do not have the opportunity in industry and business that the non-college man and woman do. This is not true any more. Whether it was ever true is a question. As business is run today, the more training you have, the more you are in demand, and the higher your salary is going to be. It is true that some of the greatest capitalists of today are not college men; some of them regret that they are not, others are proud of their ignorance. But there are two answers to this objection. The first is that the average college man or woman has no ambition to become a capitalist; and the second is that financial success is higher up the ladder than it used to be.

Rockefeller became rich because of the development of the oil industry; Schwab grew up with the steel industry. But in order to make a fortune out of oil or steel today requires more to start with in the way of education than either of these men had. There is no doubt that a college education will increase your chances of success in whatever vocation you are likely to choose. The "bread and butter" motive for going to college is entirely worthy, though not the highest.

If this is your primary motive for being in college, you will be confronted, almost constantly, with the problem of evaluating each course in terms of its probable financial rewards. This attitude will cause you much trouble and dissatisfaction. The subjects that appear most theoretical and least promising may turn out to have the greatest money value.

Some Go to Increase Their Social Standing. Some go to college because they think thereby they will raise their social standing. It is fashionable to have an A.B. degree. It is the ticket of admission into many of the higher circles of society. Of course the degree has a certain cash value but nothing like its social value. The trouble with students who work simply for the degree is that they fail to understand what the degree is for. The degree in itself

is worthless, it merely signifies a certain amount of training, culture, information and the like. Now if you have the degree but lack what it represents, you are guilty of sailing under false colors. Yet there are hundreds of students in our universities and colleges who are there for the sole purpose of getting a degree, not the things for which the degree stands. If the university would sell them a degree for so much tuition money and excuse them from all classes and examinations they would gladly accept. This class of students is not hard to distinguish from the rest. They are the ones who are continually trying to escape work; they are the first to shout when a holiday is announced; they are the first to run when the bell rings; they will do almost anything to escape taking an examination; all they care for in most courses is the credit it carries. They are always looking for the easiest courses and the ones that yield the most credit. In short, their aim in college is to roll up a score of 120 credit hours, with an average high enough to push them across the diploma line. Such students certainly care little about getting an education, all they are after is the outward signs or symptoms of an education; or better still, some means of making the world think they are educated. There is a vast difference

between going through college and getting an education.

Some Go to Get an Education. The third motive for going to college is to get an education. Many young men and women realize the need of it. They may not know exactly what an education is, but they do know that they want it and are willing to trust the university to give it to them. Such students are not necessarily grinds, though they do their work and do it well. They also take an active part in athletic, and other college activities. Leadership in college affairs usually goes to those who know best what an education means. Moreover, they are interested in making good grades and getting all the credit hours they can. But not much for the sake of credit — they see that 120 hours credit means nothing unless they have the stuff to back it up.

Students who come to college with the education motive are the ones who usually amount to most. Those who want to increase their earning power stick because they realize more and more the cash value of an education; those who are merely after 120 hours credit and the degree will stick through and average about "C" all the time; those who come because they want the increased happiness, culture and contentment that comes from an education

will likely carry off the honors. There is still another class who do not stay very long, and scarcely deserve to be mentioned. We note them in passing, hoping to save some freshmen from falling into the error of their way.

Some Go for a Good Time. There are the mistaken ones who look on college as a large house party and come for the purpose of participating in athletics or some special activity. By the end of the first year they are usually cleaned out. One by one they fall by the wayside because they will not do their work. They are often cheats and dead-beats. A large part of cribbing and cheating is done by them. Such persons are known as "college hoboes." They are the fellows who wear the "Klassy Kollege Klothes" and spend most of their time hanging around downtown or reclining in "leisure de luxe" in some elegant fraternity house. Sometimes one will manage to stay in college as long as two years, but it is seldom that he reaches graduation.

The Adjustment of Motives. One of the very first mental adjustments to be made is adjustment of motives. Whatever may have been the impelling force that brought you to college, your success while you are here will depend on your motives. To make the most of your college days you should strive

to let all your purposes and aims in college be dominated by one master motive and that to get an education. Anything short of this will mean hardship, drudgery, and perhaps disappointment, failure and humiliation. Once you have been completely "sold" on the idea of education, your work will become pleasant, drudgery will be turned into keen desire for study and your average grade will steadily rise. For to be sold on anything is to be convinced that you want it. Let any youth really hunger and thirst after knowledge, let it be the meditation of his heart and the yearning of his soul, and the battle is half won at the beginning.

How is this transformation to come about? How are you going to work up an appetite for something which is now distasteful to you? In short how are you going to get really interested in your work?

Motives for Study and Interest in Work. The best way to begin any inquiry is to get at the facts. What are the motives that impel students to go at their lessons? Why do students study? In American schools and colleges the answer to this question is short: Because they have to. Why do they *have* to study? Because they will fail if they do not. But why should they fear failure? There are several reasons. In the first place if too many subjects are

failed the student is dropped from college and this is a disgrace both to the student and his parents. In the second place, if he falls below a certain average in his work, he goes on probation. This means he becomes ineligible for activities and for fraternities. We have now found at least two motives for study: one the fear of being dropped out of college and the other the fear of probation.

These two motives, however, prompt but a small class of students. Most of you have no fears of being dropped, and some of you have no fears of ineligibility. There are other motives. You may study because you want the honor that high grades bring. University scholarship honors are objectives toward which many students work. Some want the honor because it brings approval from parents and friends; others want the things that go with honors, namely, an increase in knowledge and ability. Then there are some students who study because they are interested in their courses. They have a native liking for books and for knowledge. But this native interest in studies is never evenly distributed. Most of you have a natural liking for some subjects and a disliking for others. Your reasons for studying are not the same for all subjects.

Motives Vary from Student to Student and from

Course to Course. What we finally come down to is this: Every student has different motives for doing different lessons. Perhaps these various motives are all under the control of some master motive — as, for example, the motive for going to college in the first place. The incentive for studying zoology, let us say, is a natural liking for laboratories, with their microscopes, instruments, and notebooks. But incentives for studying French are something different. You may study this because you feel that if you do not, you will fail or perhaps you want to keep your average up to level; or perhaps you want to learn to speak French. The thing that impels you to keep up your work in mathematics may be something still different, and so on for all your courses.

It is clear to you by now that the amount of good you derive from any subject and the grade that you make in it depends on the motives that cause you to study it. The chances are that you will make the best grades in the subjects for which you have a natural liking and in which you have a genuine interest. The chances are that you will make your poorest grades in the subjects for which you have the greatest dislike and which you study because of fear of failure or some other negative motive. Interest in your work therefore becomes a big factor

in determining your success in your studies and in college.

How to Become Interested in a Subject. Psychologists tell us that we have certain native likes and dislikes. It so happens that the things we like are easy for us and the things we dislike are hard. Fortunately psychology also teaches that it is possible for us to acquire a liking for some things that we naturally dislike. We all know that a taste for some new kind of food can be acquired. There are persons who have to acquire a taste for certain vegetables. Artistic tastes are surely acquired to a considerable degree.

It is possible, then, to acquire a taste for some subjects that you have always hated. Can it be that after you have been driven through arithmetic, and dragged by the hair through geometry, after you have sworn at Euclid and cursed the man that invented trigonometry, can it be — that you may actually get to like the stuff? Is it possible that you can fall in love with the subject that you now despise? Yes, it is possible. Well, what's the trick?

The trick of working up an appetite for a distasteful subject is not simple — although it is not a sleight-of-hand performance. There is no one formula that will cover all cases, but the simplest

way of stating it is as follows: In acquiring a taste for a certain vegetable that you now dislike you do not go to the library and read about it, neither do you go to a doctor and get a prescription; you simply eat this vegetable until you learn to like it. Similarly the way to work up an appetite for trigonometry, or Latin, or chemistry, is *literally to eat it alive*. This of course is figurative and does not help much. We must delve further into the matter.

Attach Satisfaction to It. The psychologist has more to say on the subject. He says that interest in anything is the tendency to keep on doing it and get satisfaction from doing it; disinterest is a tendency to quit what you are doing because it is annoying. Now if you can derive satisfaction from studying chemistry you will soon learn to like it. The same is true of mathematics or any other subject that you dislike. But you ask me how am I to derive satisfaction from a subject that is so dry and meaningless to me? Two things at least can be done. The first is to study this subject under the most favorable conditions; that is when you are feeling good, and when there are no distractions. Second, attach to it some artificial satisfaction. For example a student works at his logic, which he hates, in order to win a prize which he very much wants. The natural satisfaction

that comes with the prize may attach itself to the logic and all of a sudden he finds himself interested in it. But there are other things he can do.

Find Out More about It. Professor Dearborn gives three ways in which to acquire an interest in a subject. The first is by collateral reading. Read not only the textbook but read other books on allied subjects. In short, find out more about it. How do you know whether you like a subject or not if you know nothing about it? Students often complain that they do not like mathematics, or science or a language when in reality their dislike is merely a cloak for ignorance. The mind naturally takes an interest in anything that offers opportunity for knowledge. If you knew anything about Latin you might like it; if you knew anything about mathematics or science you might like them. Before you set yourself dead against a subject, give it a fair trial. The second way is to do some thinking on the subject. This means raise problems and ask questions. You may think that you do not like science, but you are bound to become interested when you begin asking questions that require a knowledge of science to answer. How big is an atom? What is the evidence that Mars is inhabited? How old is the earth? How is it possible to fly in a machine

heavier than air? What makes radio possible? There are literally thousands of interesting questions like these that only science can answer. The third way is to associate with people who are interested. Interest in a subject is sometimes "caught" like a disease. If you are uninterested in English Composition find some one who is interested and talk it over. Or better still form the acquaintance of some kindly instructor in the subject and see if you cannot catch an inspiration.

Assume an Interest. Another good way to become interested in a dry subject is to "fake" an interest for the professor's benefit. Of course, you are aware of the danger of "faking" and deceiving in general. Far be it from us to encourage it. But here it seems to be justified for this reason: It is a well known psychological fact that one way to acquire the habit of cheerfulness is to smile. Smile, even if you have to force it. Try to look happy and act happy and you will soon be happy. The mind and the body have an intimate and curious relation in this respect. So, act interested, make people think you are interested, and you will surprisingly soon become interested. Your chances of a good grade in any course are dependent upon the interest that you "show." Most professors like to have their students "show"

interest, whether they are really interested or not. The point is that if you "appear" to be interested, act as if you are, the genuine interest is likely to follow. This can be done in many ways. One way is to ask questions in class. Not "fool" questions, if you do, you will give yourself away. Not too many questions, lest you become a public nuisance. Another way is, always be ready to recite when called upon. Know your lesson. There is no surer sign of interest than knowledge.

Do not Expect to be Entertained. Another prominent factor of interest in college work is the personality of the professor. Students often complain that Professor So and So is dry and uninteresting. They would like the subject if they had a more interesting teacher. There is some truth in this but it is more error than truth. In some cases it is but a flimsy excuse for poor work; in most cases the trouble is that students are spoiled by having a few teachers who are dramatic and entertaining. The fallacy is that the student mistakes entertainment for interest. It is manifestly absurd to expect your teacher to stage a first class vaudeville show every time the class meets. Neither can you expect him to keep you awake by telling jokes or funny stories. If he is a good teacher he will do little of this. The fact is

that you are supposed to be interested in the subject rather than in the teacher. The teacher is but a mere accessory to your learning. Of course, there are some teachers who have the happy knack of inspiring students and arousing their interest. This is a symptom of good teaching. But you must not expect the teacher to "interest you," you must seek to interest yourself. In short, your attitude must be active and not passive. You will never work up an interest for a course if you sit placidly waiting for the teacher to pour it down your throat.

Make an Analysis of the Subject. If everything else fails the last resort is to sit down and analyze your dislike for the subject in question. Perhaps you should do this first and not last. The chances are that your distaste is acquired and not native. We have likes and dislikes but it is doubtful whether we inherit a dislike for any subject that is taught in college. If you dislike English, or mathematics or logic or science or languages, it is very likely that you have acquired your dislike sometime in life — possibly in high school. In about nine cases out of ten you will find that the root of your trouble is insufficient preparation — a poor start. Suppose you have never learned the simple parts of arithmetic. Then algebra comes along and you are unable to

handle it. To expect yourself to like it is a psychological impossibility. The same is true of language study. How can you expect to become enthusiastic over Latin Grammar or French Grammar, if you do not know English Grammar? How can you become interested in a course in English Composition if you do not know the simple parts of speech? Another frequent cause of lack of interest in a subject is that a study of it has been associated with things that you dislike. You may have been compelled to study it much against your will. Or you may have had some unpleasant experience in connection with it and the unpleasantness has been transferred to the subject. This sort of thing happens frequently.

It is true that different methods of acquiring interest must be used for different subjects. The incentives for studying science may be different from those for studying English. The ways in which you acquire an interest in science differ in practice from the ways of acquiring interest in language. Nevertheless the general principles stated above will cover most cases.

Chapter IV

ADJUSTMENTS TO COLLEGE ENVIRONMENT

The New College Environment. The most important change from high school or preparatory school to college is a change in environment. The college environment is different in three respects. First, the things you do in college, the way you spend your time, is very different from anything you have experienced unless you happen to have gone to boarding school. Second, the physical surroundings are new. Large buildings more or less fascinating and mysterious, dormitories, boarding and rooming houses, all present a different view from what you have experienced before. To those who come from the country or small towns, the city itself is a completely new environment. If you have never lived in a big city your study problems will be greater because you will have more adjustments to make. Third, the social environment is entirely new. Unless you attended a very large high school or preparatory school, living and working with a

large group of students is new. From this crowd you will select a few friends. You will be thrown into association with all sorts of students from many parts of the world. Adjustments to this new and more or less artificial environment must be made. The way in which you fit yourself in, the way you spend your time, select your friends and do your work will determine to a very large extent your success in college.

How to Use Your Time. One of the very first things to do when you get your schedule of classes made out, and when you know what your work is going to be, is to give some thought to the distribution of your time. If you do not schedule your time you will soon find that you are wasting it at things that are of no importance. All sound business enterprises are run on a budget system. The reason is that the directors or managers must know how the money is going to be spent. Each student should by all means have a *time budget*, so that he will know how he is using the most valuable thing he has — his time.

Normally your time should be divided up between three general classes of things. (1) Your health comes first. So time must be allowed for eating, sleeping and playing (this includes exercise).

Things that must be done for health's sake should come first. (2) Study, recitation, college work, travel to and from college should come next. (3) Then comes what we shall call extra-curricular activities. Here we will include time spent in earning money or doing work for which you receive pay, all sorts of activities, such as social, literary, and religious.

The way in which you divide your time among these three classes of things will depend on many factors. One factor is your purpose or motive for being in college. If you are here to study and do mental work you will devote lots of time to that. The proper balance between these things is a matter for each individual to decide.

Principles of Time Allotment. There are, however, certain principles that will guide you in preparing your time budget. In the first place you cannot expect to divide your time equally between the three, allowing fifty-six hours a week to each. There must be an unequal division. If these three divisions were to be ranked in the order of their importance there is no doubt that health would rank first. If your health is bad, you are handicapped so that it is a waste of time to try to study or do anything else except get well again. Without attempt-

ing to lay down any hard and fast rule we would say that the average student (not every one) should devote about half of his time, or eighty-four hours a week, twelve hours a day, to keeping well. Fifty-six hours a week or eight hours a day of this goes to sleep, two hours a day or fourteen hours a week to meals and toilet; two hours a day, fourteen hours a week to exercise and play. This leaves eighty-four hours a week to divide between curricular and extra-curricular activities. How shall this division be made? In the first place nearly all freshmen are carrying sixteen semester hours of work. This means at least sixteen hours for the classroom. Some are taking laboratory work and this calls for from two to six hours. So the average freshman is spending from eighteen to twenty-four hours a week in the classroom and laboratory. This leaves around sixty to sixty-five hours a week to be divided between study and extra-curricular activities. Time must be taken out of this for travel, in some cases, and for earning money in some cases, and for other things that must be done. The student is left about six to eight hours a day to divide between studying and participation in activities. It is in the proper distribution of these hours that you must be very careful.

How to Make Your Time Budget. At first it may seem to you that it is a simple and somewhat childish matter and that a real man does not need to fool with it. But remember that you are now trying to get adjusted and this is one of the ways. True enough, after a few months your study habits will become fixed and you will not need to refer to your time-tables. But at the beginning of your college career it is very important. There are certain principles on which your time budget should be founded. Some of these we have already stated, the others have to do with making the budget.

In the first place, make the week and not the day or the month the basis. There are several reasons for this. If you plan in your budget to spend eight hours a day in sleep and try to adhere to it you will soon give up the budget idea. Something is bound to happen that will cause you to lose an hour or more of sleep on some nights. If the week is your basis and you have planned fifty-six hours in the week, what you lose on one night can be made up another night. The same holds true for study. If you plan to study four hours a day, there may be days in which you will get no studying done and other days you will have time for more. But during the week events take place so that you can even mat-

ters up and get twenty-four hours during the week. If you attempted to start out with the intention of spending exactly eight hours each day in sleep, two hours at meals, two hours at play, four hours at study, four hours in class, etc., you would soon give it up as an impractical and ridiculous undertaking. To make your time budget worth while, the week is the natural basis. A longer period, as the month for example, would not do for obvious reasons.

In the second place, before you begin your budget collect all the facts that are essential. Find out how many hours of sleep each week you actually need, how many hours you need for play, for social duties, for travel, for earning money, etc. A good way to do this is to keep a kind of daily time sheet for a week or two and see how you are actually spending your time. Each evening, the last thing you do before going to bed, write up your time diary for the day. This will give you the facts to work on. You will also find about how much time it is going to take to prepare your lessons.

The third thing is to make your budget as practical as possible. Don't be too ambitious and make up a schedule that you know you will not live up to. On the other hand do not make it too easy. At this point we cannot resist quoting from Dr. Adams'

admirable book "A Guide for All Students." Dr. Adams in speaking of time schedules says: "In drawing up your time-table you must not be too heroic. When you first sit down to consider the whole question you will probably feel yourself in a glow of noble determination to do the thing very thoroughly. It is like making up one's mind to get up very early next morning. For the time being you are warm and comfortable and full of resolution. Nothing seems too drastic. . . . In order that you may live up to your time-table you must estimate very carefully beforehand your capacity for work. You must try to gauge this pretty accurately, for there is almost as much danger in under-estimating as in over-estimating your powers."

Fourth, revise your budget occasionally. You will find that the demands on your time are constantly changing. As the school year progresses you may find that you are in danger of failing and need more time for study. Or you may find that you need more time for earning money, etc. Change your schedule to meet your changing needs. This is what the budget is for; to help you keep track of what you are doing and how much time it takes.

Distribution of Time among Your Studies. In your budget you have allowed so many hours a week

for study. The next problem is to apportion this time among the various subjects. Most of you are taking five or six courses. How will you divide your time between them? Obviously no rule can be given. It will depend on how easy and how hard some subjects are. The easy ones will take less time than the hard ones. But do not make the mistake of spending too much of your time on the subjects that you like. Your natural tendency will be to neglect the hard ones and the ones you dislike. Something will depend on the demands of these courses. Some courses are more exacting in the daily routine of work than others. Courses in which you know you will be called upon to recite will receive more constant study than others. Herein lies a great danger. Do not put off work in any course just because you can. Try to keep all your work up to an even level. This will relieve you of the necessity of cramming later.

The Best Time of Day to Study. What is the best time each day to do your mental work? The answer is, do your studying when your mental efficiency is at its peak. Of course, there are certain hours when you must attend class, or when you must do other work. But after all, the major part of your time is free. Most of you have on the average three or

four classes each day including laboratory periods. These may be bunched on MWF or TTS but usually they are spread out over the week. This leaves you at least one or two morning hours free and two to four afternoon hours and all the evening hours. When you do your studying is a matter of personal taste. Some students prefer to rise early in the morning and study before breakfast for an hour or more. (Such cases have been reported but they are rare.) It is commonly supposed that the mind is clearest and concentration is easiest in the early morning when you are rested. Scientific investigations have shown that this is not always true. There are students who maintain that they do their best work late in the afternoon, say just before dinner; others prefer to study late in the evening between the hours of 11 P.M. and 2 A.M. The late evening certainly has the advantage of being less likely to have distractions and disturbances of various sorts.

It is well known that one's efficiency curve rises and falls during the day. It is impossible to maintain a steady level of mental work for a long period of time. Daily fluctuations of mental efficiency appear to be largely a matter of habit. If you are in the habit of doing your mental work in the morning, it will appear to be the time of your greatest mental

efficiency. The same is true of the evening, or midnight or cock-crowing. Of course, your efficiency level at any hour in the day depends on what you have been doing previously. Do not assume that at a certain hour each day your mental efficiency rises automatically to a high level and an hour or so later goes down again. However, if you do find that there are certain hours in the day during which you seem more mentally alert than others, try to arrange to study at those times.

There is a curious social element entering into the time of study. Back in high school when you studied in a big hall with all the rest of the students you found concentration easier than you did at other times. There is a tendency for us not to want to study when we think no one else is studying. If on the other hand we feel that everybody in the dormitory or house is studying there is a strong tendency to do likewise. There arises a kind of a consciousness of the proper time for study. To test this, try studying when all the rest are out at a big football game. You will find it twice as hard as it would be if no game were on and you "thought" others were studying whether they were or not.

The Advantages of Fixed Study Periods. After you have found the hours during which you can

study best try as best you can to keep these set aside for study each day. Some of the advantages of having set and fixed periods for study are the following: (1) A time-study habit will become fixed and when the study hour arrives it will be as easy for you to go to your books as it is for you to go to bed when sleeping hours arrive. (2) It relieves you of the necessity of having to make a decision to study each day. Your decision is made in advance and you study as naturally when the time arrives as you eat at meal time. No definite conscious decision must be made to eat at noon, or evening. (3) It prevents procrastination. Putting things off is a bad mental habit. (4) It safeguards you from all kinds of interruptions. When this time-study habit becomes fixed it will aid in refusing invitations that interfere with the preparation of work.

The Proper Length of a Study Period. If you have allowed yourself, say, twenty-four hours a week for study, how are you going to distribute those hours throughout the week? In your high school days this problem probably did not arise. It was a matter of preparing each lesson the day before or a few hours before the time for recitation. In college it is different. It would be possible for you to do nearly all your studying for one week in two sittings

if you want to do it that way. The old motto of "Work while you work and play while you play" refers more to the intensity and vigor of work than to the length of time. It would be foolish to say "I will turn in now and do all my playing for the week this afternoon and evening and get it off my chest." Some students do this very harmful thing with their studies. They work "steady by jerks." At the other extreme there are those who study a very short while, say five to fifteen minutes, and quit. This is about as bad as attempting to do all your studying at one time. A certain amount of time is required for warming up, and getting into the lesson.

Factors that Determine the Length of a Study Period. First, if a lesson is not too long it should be completed in one sitting. If it is too long to complete at one time, it should be divided up according to its natural divisions. Second, your state of health at the time is an important factor. If you are feeling fit and in good condition you can study longer at a stretch than you can when you are tired or sleepy or in poor health in general. Third, subjects in which you are interested can be studied for longer periods of time than uninteresting ones. Fourth, hard assignments should be studied in short install-

ments, and easy assignments in longer installments. The reason for this is that the harder subjects are more fatigue-producing than the easier ones. Fifth, the total length of a study period depends on the number of subjects to be studied. If you have several assignments to prepare and can change about, it is possible to increase your total time without ill effects. When this is the case the order in which you take your lessons is important. Always begin with the hardest and end up with the easiest. The mind is freshest and concentration is surest at the beginning of the period. Some students find it a good plan to alternate the easy and the hard. They take first an easy one, then a hard one, and in this way there is a balance or compensation taking place that enables them to study for a very long period without fatigue.

The Proper Balance between Work and Rest. Psychological experiments show that short work periods with short rest periods are much better than long periods of work and rest. If a student has two hours in which to do a piece of work that can be done in one and a half hours, it is better to distribute the half hour allowed for rest throughout the whole time. That is, rather than work constantly for an hour and a half, then rest a half hour, it is better

to work, say thirty minutes and rest ten, for three periods. Even shorter work and rest intervals are better. The practical conclusion for students is that the best results are usually obtained by taking a few minutes off every half hour or so to get up and stretch, or walk around the block. These brief recesses are often very refreshing. They have another effect. When a given amount of material has been learned, time must be allowed for it to "set" or "soak in" before attempting to learn more. You may have noticed that in reading a book you will seem to have the contents of a page well fixed in mind, but when you go on to the next page and try to get more ideas, the new ones tend to cause you to forget what was on the previous page. This very fact makes study difficult for those who do not know the trick of letting an idea "settle" or "set" before crowding it with other ideas.

The Physical Environment of Study. We now turn from the question of "When" to the question of "Where." The place of study is just as important as the time for study. This is a new problem which you did not have in high school. There you did most of your studying in a study hall or in your own home; here you must study in a totally different environment. Most college students do their

studying either in their own rooms or in the University Library, or some other place set aside for the purpose. Once in a while on a fine day students will try to study out of doors. This seems like a good place but it never works very well because of the numerous distractions. By all odds the best place to study is in your own room. The practice of going over to your neighbor's or friend's room under the pretense of studying, but with the real motive of killing the time of all concerned, is a very bad habit.

The Best Place for Study. In regard to a place for study there are just two principles to be observed. First, pick out a place where you will be undisturbed and a place that is as quiet as possible. Second, always study in the same place. Unfamiliar places are always more or less distracting. The body is a wonderfully adaptative mechanism. Once you have become adjusted to a certain room, a certain chair and a certain table, with certain pictures on the wall, and certain definite conditions, you become settled, as it were, and your mind is not easily distracted. Some students have a special chair and a special table dedicated to study and kept at all times sacred from loafing or idling. When you sit down in your study chair and at your study table do not allow yourself to do anything but study. This may

seem childish if not absurd, but if you establish a definite place-study-habit, when you go to that place your mind will go to its work without any further coaxing. The same is true of eating and sleeping. When you enter your bedroom at bed-time you almost unconsciously begin to undress and prepare to retire. The same will happen when you establish the study chair and study table habit as firmly as you have the bed-sleep habit.

Orderliness is Important. Another important adjustment to your study environment is that of orderliness. A desk with books, papers, pencils, blotters, pipes, etc., all strewn around; a book shelf with books upside down and every way, all betoken a disorderly mind. It is truly remarkable how one's desk and general environment reflect the state of mind. It is also true that keeping your desk and room in order helps to keep your mind in order. Moreover, there is a practical disadvantage to disorder. Notes and important papers get lost in the shuffle. Many times students complain of having lost their notes and months afterward find them among a pile of papers right under their very noses. There is the opposite extreme to which some super-systematic students go; they spend so much time keeping things in order that they get little else done.

The adjustment of orderliness is an important one nevertheless, not only for your present good but for your success in after life.

Proper Lighting and Heating. Other important adjustments are those of lighting and ventilation. There is nothing so important to the student as the matter of light, especially if most studying is done by artificial light. Daylight is the normal and proper light in which to study; if daylight is not available then it should be approximated as closely as possible. Of course, it is impossible for you to exercise complete control over the illumination of your room. There are, however, certain rules to be observed and things to be avoided.

First, have your room lighted as uniformly as possible. Use an indirect lighting system. If you have the ordinary electric light swinging from the wall with a shade throwing the light directly on your table, the thing to do is to invert the shade so that the light will be reflected from the ceiling. This will give you a more uniform light in your room. Second, avoid glare on your books and papers. Smooth surfaces are likely to give this glare, which is very injurious to the eyes. Glare can be avoided by changing position in respect to the light and by using indirect lighting. Third, avoid the use

of eye shades. Shade your lamp and not your eyes. Eye shades cause headaches and are bad for the eyes. Fourth, be sure that you have sufficient light, but not too much. Too intense light is about as harmful as too dim light.

Heating and ventilation are important factors in study. Heating or temperature is really more important than ventilation. Rooms that are too warm cause drowsiness and headache and sluggishness, while rooms that are too cold cause distraction. The proper temperature for study is about 65–70 degrees Fahrenheit. The humidity or moisture of the air is important. In steam heated rooms the humidity or moisture remains about as it should be but in hot air heated rooms the air is too dry. It has been estimated that in some rooms where students work the air is drier than the Sahara desert. The air can be moistened by the use of a pan of water in the room.

Distractions. There are two principal classes of distractions; external and internal. The internal distractions will be treated in another place; here we shall deal with the external. External distractions are of many varieties depending on the way they act. Sound distractions are the most common. Various kinds of noises are apt to disturb your study.

Noises are from a few well-known sources, such as street cars, telephones, conversations, and music (so-called). Then there is a visual class of distraction. These are objects round about that naturally attract attention. Colored objects of various sorts are likely to be distracting. There are temperature distractions; all sorts of bodily discomforts such as tight clothing; studying should be done in loose-fitting garments. Such distractions are not hard to overcome and offer little difficulty because adjustment to them is easy. The most important are conversation and so-called music which are sometimes hard to resist. There is no remedy except to ignore them or leave them by retreating to some quiet place.

Psychological experiments on this sort of distraction show that it is very common to do better mental work under distraction, or work as good as that done when there is not distraction. The reason is that the distraction causes you to summon more energy and go at your work with more vigor and determination. It would be a mistake to infer from this that distractions are to be sought. However, some mental workers like to work amid noises and other distracting influences. The harm done is that more energy is required to work, and fatigue comes on quicker.

The Social Environment. By far the most dis-

tracting influences are social. You may adjust yourself to the noises from the street, to the victrola overhead and the banjo beneath, to heat and cold and all the rest; but the adjustment that is hardest to make is to other persons. These human distractors operate in many forms and divers manners. First there will be times when you want to study and someone in hearing distance is reading aloud or carrying on an animated conversation. This sort of thing is hard to neglect. Then there will be times when you will have visitors. They always "drop in" when you don't want them. Every college has its quota of pests who never seem to study or let anyone else study. Somewhere in the Bible there is a verse that says: "Be ye not unmindful to entertain strangers, for some have thereby entertained angels unaware." Now the number of these visitors who are angels in disguise is hard to say. It is always a problem to know just how to treat them. One effective method is to lock your door and not answer when they knock. Just what to do in each case is a matter for your own ingenuity and common sense. As one student put it, "kiss 'em out the door."

Other social distractions are invitations to parties, dances, socials, and other "affairs." This is the worst

thing to contend with and the hardest thing to resist in addition to being the most damaging thing that can happen to your studies. Of course, you want to be a "good sport" and all that, but at the same time you know you ought to keep up with your studies. In the long run your fellow students will think more of you if you have the backbone to say, "I am sorry, but I must study." Social affairs should be taken care of in your time budget. Having determined how much time each week you can afford to spend at this sort of thing, stick to your resolution. Then after you have spent your week's allowance lay off until the following week. This is the easiest and surest way of making the adjustment.

Study Partnerships. Another social adjustment pertains to study teams and partners. Some students make it a practice of studying with others. Sometimes this is a good practice, more often it is bad. Dr. Adams says: "A partnership in study almost invariably resolves itself into one of the partners becoming the teacher, and the other the pupil. This is not so serious a drawback as it looks, for the student who turns out to be the tutor does not really lose . . . while the student who becomes the pupil has obviously no right to complain. A partnership is inadvisable in the case of great inequality in abil-

ity or attainments between the two students. Here the pupil-partner becomes an unfair drag on the teacher-partner."

This is not the only danger. A greater objection to study partners or study groups is that more visiting than studying is done. The lesson under discussion suggests too many topics for further conversation. Another danger is the tendency to divide up the work between the partners or members of the group. If collateral reading is to be done, some students will organize a team and each will do a part. Aside from the ethical aspects of such practices, the participants are all cheating themselves.

On the whole then, partnerships or group systems of study cannot be recommended. First, because the partners are never equally matched and one carries the other along; second, there is a strong tendency to loaf, or play games; third, there is a danger of unethical distribution of labor.

Getting in with the Wrong Crowd. Very often it is said that students fail in college because they get in with the wrong crowd. No doubt there is a certain amount of truth in this statement. On the other hand, it is true that "water seeks its level" and "birds of a feather flock together." If a freshman is studious and serious about his work he will

be likely to drift in with others of the same type. There is a genuine danger, however, of drifting in with the wrong type of associates, especially in universities that are thickly populated with fraternities and sororities. It is not the purpose of this book either to praise or blame fraternities; but it should be said that from the point of view of study there are "fraternities and fraternities." Some foster a high grade of scholarship, others go in for activities and social life.

Choose Your Associates. It will be very much to your advantage to select carefully the crowd with which you will associate. Do not rush in too quickly. Before you will be invited to join a fraternity or any other student social organization your case will be investigated. It is just as fair for you to investigate them as for them to investigate you. If you do join a fraternity or club do not limit your friendships to this little circle. One of the finest things that you will get out of college will be the lasting friendships which will continue throughout life. But do not try to spread your friendships over too much ground. Have a few good friends, but have also many acquaintances. There is no reason why you should not know as many as three or four hundred. You should cultivate habits of good fellowship and

congeniality. Whatever else you do, do not make the mistake of being a recluse. In whatever occupation you may follow in life you will have to mix with people more or less. College is a good place to begin.

Chapter V

PRINCIPLES OF HOW TO STUDY

The Advantages of Knowing How to Study. In the last three chapters we have considered some of the fundamental adjustments that are essential to success in college. In this and the next few chapters we shall take up some problems of study principles and technique. First we shall deal with the general principles which underlie all kinds of study and then pass to the various types of study.

The advantage of knowing how to study is about the same as that of knowing how to do anything. The old adage that "it's all in knowing how" applies very definitely here. At first it may appear that there is only one way to study, and that is just to get down to work and do it. No doubt every person who has done very much studying has worked out a special way of doing it. This way seems best. Some persons have a very definite system and follow a set routine; others go at it in a hit-or-miss fashion. There is not more than one chance in ten thousand that a student will "hit" on the best study methods.

The point is well illustrated by learning to typewrite. Suppose you are given a machine and told to go work now and learn to run it. You will begin by picking out the letters that spell your name, practice these a while and learn to write your name. Or you may be given a sample sentence to copy, one that contains all the letters of the alphabet. By and by you will be able to write by picking out the letters visually, but you will never become a good typist. You have learned the wrong method. The touch method is right, but harder to learn; it requires more effort at the beginning, but it is far more economical in the end. The same is true of learning to do anything. Learn by doing but be guided in your doing. In learning how to study without guidance or suggestions, you are just as likely to go wrong as you are in learning to typewrite.

The student who has a carefully worked out system of study based on sound principles of psychology has certain very definite advantages. First, such a system saves time. If a lesson can be learned satisfactorily in one hour, why spend two or more hours on it? Second, it prevents waste of energy. The effort put into mental work is energy and the more energy that is spent without yielding returns, the more inefficient you become. The right method

of typewriting is very easy compared with wrong methods. Third, it enables one to shorten the college course. A student who can use his mental powers to the maximum with a minimum of energy and effort can carry twice as many hours as the inefficient student. Fourth, it allows time for outside work. Instead of using the time saved to shorten your course, you could use it in other ways. Fifth, it makes study a pleasure. Doing anything that you know how to do and can do well is always enjoyable. Sixth, it prevents embarrassment, discouragement and sometimes failure.

Statistical Information Showing the Advantage of How to Study. In some of the leading high schools principals have gathered statistics bearing on the question of supervised study. All results show very conclusively that those students whose study was supervised and who were taught the best methods made the highest grades. In one school it was found that students who had been taught how to study averaged five points higher than the others. In commenting on these figures one writer says: "The practical implication of these data is that pupils stand well in a subject in proportion to the extent to which they are explicitly conscious of the methods of study for that subject." In general all statistical investi-

gations show two things very clearly: (1) That students who know how to study make higher averages than those who do not, provided all are of equal intelligence. (2) That knowing how to study reduces the numbers of failures as much as 50%.

Different Types of Study Technique. Study is a broad term covering many sorts of mental operations. The mental work that is required to study different subjects is the same in respect to such matters as concentration and the like, but is different in the methods of approach. In this course we shall consider five types of study. (1) The *reading type* in which study is merely a matter of reading. (2) The *memorizing type* which consists of memorizing vocabularies, or dates or facts of all kinds. A large part of study work is of this sort. (3) The *habit formation type* which aims to establish definite habits. Learning to run a typewriter or play a piano or perform any skilled act is an example of this type. (4) The *collecting and organizing data type* found in sciences and in writing original papers. (5) The *problem solving type* of which mathematics is the best example.

No one type of study applies exclusively to any subject. All subjects involve more or less of all

types. But usually one type predominates. In science study means collecting and organizing and interpreting facts; in mathematics, study means solving problems; in English, study means reading assignments and writing themes, and so on for all subjects. Underlying all these types and running through all sorts of subjects are certain general principles of study which we shall now state in the form of propositions.

Proposition I. All study should be done with a view to accomplishing certain well defined ends. A good deal of so-called studying is somewhat like the farmer who when seen carving a stick of wood was asked what he intended to make, and answered that he did not know, he was just whittling. Ask the average freshman as he pores over his books what he is after, and he may answer, "Nothing." He is just studying. This haphazard, hit-or-miss fashion of studying gets you nothing except trouble. Of course, your freshman might answer that he is getting his lesson. Why? Because he was told to get it. Get what from it? He doesn't know!

The very first step in lesson preparation is to understand the assignment very definitely, explicitly and precisely. Unfortunately some professors are very vague in making assignments. Still more

unfortunately many students are still vaguer in their understanding of the clearest assignments. Time and time again they will come around and complain, "I didn't know we were to do that." It seems as though students of average intelligence should have no trouble in comprehending what the instructor requires of them, but the fact remains that many failures are due to this one defect. It is therefore worthy of attention, even for college students.

In the first place you must recognize that there are many different kinds of assignments. These may for convenience be grouped under three heads.

(1) *Chapter, Page or Paragraph Assignments.* In which so many pages are taken, or certain selected paragraphs, or certain chapters are given. The danger of misunderstanding arises here when the pages, paragraphs or chapters are not consecutive, or when they are assigned from different books. This is not all. You should know, and know definitely, the sort of thing you are to do with these pages, paragraphs or chapters; whether you are to outline some or all of them, or just read them over, or study them closely with a view to definite recitation. If it is translation of foreign language, you should know whether you will be held for all construction as well as translation. In short, there are

many details about an assignment that you must know before you can prepare a lesson intelligently.

(2) *Topic Assignments.* Instead of giving a certain number of pages the instructor may assign a topic. Such assignment may cover several recitation periods. The instructor may say, "We will now take up the question of 'irregular verbs'" or the "fourth declension" or the topic of "electricity" or "respiration." If the assignments are made in this fashion your aim in studying is somewhat different from what it would be if certain pages were assigned to be read. Many of your science assignments will be made in this very order. The chances are that the instructor wants you to find out all you can about the topic. This you will do in various ways, by reading, observation and conversation.

(3) *Problem Assignments.* You may be given certain problems to solve. Not necessarily mathematical problems but any kind of problems. In college you will have many such assignments. In a certain course in college algebra the professor assigned certain work to be done. The aim of the lesson was to get the students to thinking and reasoning in a particular way. He said to his class, "Now for the next time you will be expected to know how to *reason* out certain things in certain ways. For

guidance and practice in this sort of reasoning you may work on problems 2, 4, 7 and 9 on page so and so." What happened? Nearly all went to work and merely " found the answers " to these problems. They were told to do some reasoning, and to learn how this sort of reasoning is done. That was the problem. What they did was to juggle letters, symbols, and figures in such a way as to come out with an answer that tallied with one found in the back of the book. Little if any reasoning was done.

Some Suggestions on How to " Get " the Assignment. (1) Be sure you understand what the words mean. Each new lesson is likely to contain some new words. The instructor will use some of these words in making the assignment. Don't be ashamed to ask him for a definition or look them up before you begin the lesson.

(2) Keep the attention alert. Half-drowsy students or students who are not listening will miss what they are told to do. Some professors make assignments at the end of the hour and often after the bell has rung. The minds of the students at this period are not in an attentive state. They are in a hurry to get away and the instructor is also in a hurry. The total result is that the assignment for the next time is not fully understood.

(3) Know enough about what has gone before so that you can intelligently comprehend what is to come later. Failure to understand anything is usually due to insufficient knowledge.

Proposition II. Attack every lesson with vigor and zeal. You will never learn a lesson by merely exposing yourself to it. Your attitude toward your assignment must be active and not passive. You will always be on the offensive. Every assignment is a battle to be fought, a problem to be solved. The best way to get into this problem-attitude of mind is to begin your lesson by asking a series of questions. Then let your study be a means of finding answers to these questions. Of course, you may not find the answers but you will always find something. If you are desirous of knowing certain facts about a topic you quite naturally go to some one and ask questions. If the person whom you ask knows and tells you, but you do not understand, you will not nod your head and go on, but you will keep on asking until you are satisfied with the answer. The same is true of studying, which in a sense is asking questions of books. If at first you do not get your answer you keep on looking and reading until you find it. This all ties up with the first proposition: Have a definite aim in each lesson. If your aim is to find

out the exact meaning of a page of Latin or French or any language, you should keep digging until you know exactly what it says. First, have a problem to solve, a question to answer, a goal to reach; and second, don't quit until you have solved your problem or answered your question or reached your goal.

Proposition III. Relate the Particular Lesson, Topic or Assignment to the Course as a Whole. No course is merely a series of lessons or assignments. There is always some fundamental organizing principle or some big idea. The assignments are nothing but convenient divisions. Many students are like the old farmer who on his first visit to the city complained that he couldn't see the town for the houses. In the minds of many honest students history is nothing but a lot of dates and facts strung together like beads on a thread; and science is a jumble of disorganized information. The importance of getting the main "drift" of a course is well illustrated in making a translation from a foreign language. One way to do translations is to take a dictionary and look up every word, write down its English equivalent, then put the English words together in sentences. Sometimes the sentences make sense, most of the time they do not. This is a thoroughly bad method of study. The best way is to

strive to catch the idea that is expressed in the foreign language; get hold of the thought and express it in English. Once you get the "drift" of a passage the translation is made much easier.

Studying is much like building a house. When the carpenter puts in a board or a joist, he is fitting it into a planned structure. If the building is large and complicated he works from a plan or a blue print. Every course is a unit, and the lessons are like the boards that go into the house. There are ways of keeping track of yourself in your work and preventing yourself from getting lost in a maze of lessons.

(1) Form the habit of reviewing the previous lesson before you begin the next. This has a twofold effect. First it makes the connection, and second it gives you a start. The mind works best when it has a starting point. Moreover, the new should be connected with and built on the old. This is especially true of mathematics and languages. Here frequent reviews are almost necessary.

(2) A general outline of the whole course will serve as a blue print from which to work. Such outlines are sometimes hard to obtain. When a textbook is used, it is well to go over the table of contents carefully and see what it covers and how

the material is organized. In case you have no textbook, your instructor will generally supply you with the main facts for such an outline. This will be a kind of framework or skeleton into which you will build each lesson or topic as you go.

Proposition IV. Study Always with a Critical Attitude. In all forms of study that involve reading and remembering facts selection must be made of those facts which have special importance and which are worthy of remembering. Not every sentence in a paragraph has equal value with other sentences. Usually there is a key sentence and all the rest are explanations and elaborations. This does not mean that the less fundamental parts are to be omitted. They must be mastered and comprehended but their importance is subordinate to the essentials. In problem solving there are certain facts and points which when located lead directly to the solving of the problem. The wise student is always the one who can locate the clue that leads to the solution. Where the aim of study is to collect and assemble information nothing is more necessary than to select the important items. There is a great danger of filling your notebook with worthless material. When facts are to be memorized careful selection is still more in demand. To

make memory serviceable it must not be burdened with useless facts. Thus in all types of study, such as reading, problem solving, collecting information, and memorizing, care must be taken in selecting those facts that are of special importance.

The inability to sift the wheat from the chaff is well illustrated by the non-critical attitude of many students. So accustomed are they to accept wholesale and swallow completely all that is in the book or all that the teacher says without ever stopping to question the boldest absurdities, that it is almost impossible to change this frame of mind. If it's in the book, it must be true; if the teacher says so, it must be so. Why? Because the book or the teacher says so. It is true that textbooks are usually correct as to the facts, but they may be wrong in the interpretation. Sometimes a teacher will make a mistake. This, however, is not the point. The point is that the habit of taking in all that you see or hear from some authoritative source without ever questioning it, is a bad mental habit. If the first meaning suggested to you by a sentence seems queer, go back and read it again; if an observation appears off, make it over again; if your answer to the problem looks absurd, do your work over.

There is a danger of leaning over backwards in the matter of a critical attitude. It is possible to become too critical. The student who is always ready to contradict and argue every point is about as bad as the one who swallows everything without question. This super-critical frame of mind very soon leads to a dangerous point — the point of thinking that everything is wrong and therefore unworthy of further attention. It soon becomes chronic and the student lapses into a habit of fault-finding. It is easy to find fault, but hard to criticize.

The critical attitude must be both sympathetic and respectful. Otherwise it becomes egotistical and harsh. McMurray says: "The unquestioning frame of mind that allows a sympathetic approach to an author marks one stage in study; but this must be followed by the critical attitude before study is complete. That the two attitudes are not incompatible is well stated by Porter in the following words: 'We should read with an independent judgment and a critical spirit. It does not follow, because we should treat an author with confidence and respect, that we are to accept all his opinions and may not revise his conclusions and arguments by our own. Indeed, we shall best evince our respect

for his thoughts by subjecting them to our own revision.'"

Proposition V. Do All of Your Work Thoroughly and Completely. In an old Third Reader there is a little verse that runs as follows:

> "If a task is once begun,
> Never leave it 'til it's done.
> Be the labor great or small,
> Do it well or not at all."

Nothing is quite so damaging to mental vigor and self-respect as half-studied lessons. The student who is content to let his work drag along doing barely enough to squeeze through may never hope to achieve success. A recent writer on the art of study observes: "Most pupils are unable to produce results in recitation proportionate to the time spent in study because of the waste of *under-learning*. They *almost* get needed information clearly in mind, but stop while it is still so befogged as to be unreliable or misleading. They think they have solved problems, but fail to reach a point of unquestionably proved results, or even of knowing precisely how those were obtained which they have. They *almost* master some important facts to be

remembered, but reproduce them, if at all, in a form so mangled and incoherent that they are useless unless completely rehabilitated. . . . Pupils should learn that from the standpoint of actual results such study is a wretched waste of time. The workman who carries his burden *almost* to the top of the wall might have saved his strength by leaving it on the ground from the first. It is the last determined blow, or the last persistent ounce of pressure, which cracks the nut; without completing effort, all preceding pains would have been wasted."

Dr. Adams in his Students' Guide has some interesting things to say about thorough work. He quotes from an out-of-date Students' Manual this passage:

"Passing over a field of study has been compared graphically to conquering a country. If you thoroughly conquer everything you meet, you will pass from victory to victory; but if you leave here and there a fort or a garrison not subdued, you will soon have an army hanging on your rear, and your ground will soon need reconquering. Never pass over a single thing, however minute or apparently of little consequence, without understanding all that can be known about it. He who accustoms himself to pass over a word or sentence, or a single

point of mathematical inquiry, without thoroughly understanding everything that can be known about it, will soon be known as an inaccurate scholar! "

In this connection a very practical question arises. How long should you wrestle with a difficult point, say a problem in mathematics or a hard passage of Latin, or an abstruse statement in Shakespeare, before giving it up with honor? When is it justifiable to seek outside aid? There are three ways in which a student can deal with a difficulty: (1) Avoid it when you see it coming by quitting or sidestepping; (2) Get somebody to help you out or if it is translation, — ride a pony; (3) Fight it out for yourself. But suppose you are defeated, what then? Recognize the fact and pass on with a determination to return and conquer. There is considerable gain made when you have localized your difficulty and defined it. The answer will come sooner or later. Often it comes sooner than you expect. In some moment when you are least aware of it you may stumble on the solution. After working for an hour or more on a difficult translation or mathematical problem you give it up and go to bed. The next morning when you are rested the solution may suddenly dawn upon you. Never

quit. A quitter in mental work is just as despicable as one in athletics.

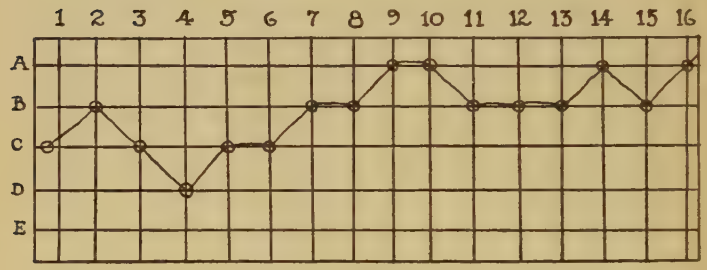
Proposition VI. Check Up and Grade Yourself. There is no greater incentive for study than to know how you are getting along. Interest in improvement is an aid to further improvement. When improvement can be roughly measured or graded the interest becomes keener. A good habit to establish is that of running a system of self-grading. It requires a little time but is well worth it.

In the first place before leaving your assignment take a little time for a final try-out. If it is memory work, recite it over once more to make sure you have it; if it is general reading, go over the main points again; if it is problems, check back for possible mistakes; if it is language, try out your translation. In each case mark yourself on a scale of A, B, C, D, E.

Some students find it valuable to compete with what golf players call bogey. They compare their work day by day and each day try to beat their previous record. Charts, curves and diagrams are helpful in this respect. On cross-sectional paper let one side represent days and the other grades. Each day make a point opposite the grade you give

yourself. Later connect the points with a line and get your learning curve for that subject. These graphic pictures of progress are valuable stimuli. The following is a sample:

MATHEMATICS



The curve is a picture of progress in mathematics for sixteen weeks.

Summary. The six fundamental propositions on which effective study is based are:

(1) Have a definite aim. Be sure you completely understand the assignment. Know what you are going to do.

(2) Go at every lesson or assignment with vigor, zeal and enthusiasm. Take an active, aggressive attitude.

(3) Relate each lesson or assignment to the course as a whole.

(4) Study always with a critical attitude. Still be sympathetic and respectful.

(5) Do all of your work thoroughly and completely.

(6) Keep a constant check on yourself by a system of self-grading.

Chapter VI

THE READING TYPE OF STUDY

All Study Involves Reading. Mention has been made of the various types of study. The reading type is considered first because all study with a few exceptions involves more or less reading. There are different amounts of reading required with the study of different subjects. At one extreme there is English Literature which is almost wholly a matter of reading and comprehension and appreciation; at the other extreme there is mathematics which involves very little reading. Of the total time spent in study by the average student approximately one-fourth is spent in reading. This does not include the study of foreign languages unless the student knows the language well enough to read it rapidly. The freshman year requires less reading than the other years. Indeed, it might be said that as one progresses through college the amount of reading required is greatly increased. The student who can read rapidly and accurately has a great advantage over the one who cannot.

Most Students Cannot Read. It is a common complaint among college professors that students cannot read the English language. This is astonishing but very true. Everybody can pronounce most of the words in a college textbook, but this is not reading. There is a vast difference between "going over" a lesson and reading it. Students fail in algebra problems because they cannot read; they fail in science because they cannot read the directions. Roughly speaking, reading is getting the *meaning* from a sentence or paragraph. Presumably the author has an idea to convey in his book or paragraph. To read it is to "get" this idea correctly. Reading is comprehension.

Dr. Adams, in a book previously quoted, observes: "Students are very apt to point out how many hours they study per day. But this is meaningless unless we understand what kind of study it has been. It is quite possible to read a book and to turn over the pages systematically as you reach the bottom of each, and yet know nothing of what you are reading. A student of the wool-gathering type may be reading a textbook in preparation for an examination. He is actually following the words on the page, for the observer can note how his eyes move backwards and forwards. Yet if a sheet of

paper be thrust between his eyes and the book, and he is asked some question on the text, it will be found that he does not in the least know what he has been reading about. His attention has been elsewhere all the time. This kind of study is not only useless, but it is worse than useless; for it actually cultivates the lack of power to concentrate our attention at will."

There are several reasons why students cannot read. In the first place they have not been taught to read. Back in the grades where reading is supposed to be taught the student learned merely to pronounce a string of words. That is, oral reading is taught, or it used to be. (It is different now.) Careful experimenting has revealed the fact that ability to read orally does not imply ability to read silently. Since most of the reading done in college is silent reading, the kind of reading taught in the schools is poor preparation. Those of you who learned to read by the oral method must also learn to read silently if you expect to succeed in college.

Another reason why college students cannot read is that they have drifted into bad habits of attention. Real reading requires rigorous concentration. It does not require much concentration or mind

power to read the average newspaper; but it requires a lot of it to read a college textbook. The type of mental activity involved in reading a story, or a newspaper, is quite different from that required to read a solid book. The difficulty seems to be that the average student attacks his lesson as he would a novel or a newspaper. The difference between reading a story and reading a lesson is one of the amount of mental effort required to comprehend the meaning. Ability to put forth the necessary effort and in the right direction is the thing that must be acquired.

Concentration the Basis of Reading. Reading is impossible without concentration on the material being read. Some types of reading require more effort than others but all require concentration. Concentration is of such great value not only in reading but in other study that it requires extensive discussion here.

What is Concentration? This word, like many others, has been extremely misused and abused. The *New Thoughtists* and others have taken it to mean some sort of weird mental gymnastics by which a person can obtain his heart's desires. If you want anything, just concentrate on it and you will get it. To the college student it should mean

no such thing. A good description of it is as follows:[1] "By concentration of attention is meant the depth of the attention, and this is measured by the ease with which a person's attention can be called off the topic with which he is concerned. The concentration may be so great that the individual is oblivious to all that goes on about him. He may forget engagements and meals because of his absorption. Sometimes even physical pain is not strong enough to distract attention. On the other hand, the concentration may be so slight that every passing sense impression, every irrelevant association called up by the topic, takes the attention away from the subject."

Concentration is not Forced Attention. There is a common notion that concentration requires great mental effort if not to say agony. Nothing is farther from the truth. Complete absorption in a subject is not unpleasant. Indeed, it is fascinating. Persons who concentrate deepest are those who get satisfaction from what they are doing. Concentration is not mental drudgery. It is work, to be sure, and requires energy, but the energy is put forth with pleasure. When the attention is held to a subject in which an interest is taken and from

[1] Strayer and Norsworthy, "How to Teach," page 38.

which satisfaction comes, it is called "free attention"; when attention is sustained by an effort of will it is called "forced." At the beginning of most mental tasks attention is more or less forced, unless there is an element of interest in it to begin with. As the work proceeds interest picks up and attention becomes free. Learning to concentrate means deriving this free type of attention. Of course, there will always be times when attention must be forced and the student who has not the will power to force himself to study a difficult topic cannot hope to succeed. Both free and forced attention are essential.

Aids to Concentration in Study. Students who experience difficulty in concentrating their minds should make a complete survey of the facts and principles of attention with a view to getting a better method of work. There are certain aids and devices, some mechanical and some psychological, that greatly enhance concentration.

(1) *Take an attentive attitude.* When you begin work get your material ready, have your desk in order and begin going through the motions of study. Attention, among other things, is a bodily attitude of *preparation* or *readiness* for further activity. When the soldier comes to attention he

gets himself in readiness to carry out any command that may be given. He assumes the position of attention which is well defined and very definite. It is a position from which any command may be executed. This is real attention. In listening to a lecture you assume an attentive attitude by taking your seat and getting ready to hear what the speaker has to say; during the lecture this attitude must be assumed. It is far easier to listen when you are sitting erect with head up and eyes centered on the speaker than it is to slump in your seat and close your eyes. You literally listen with your eyes and with your whole body. The same is true in reading. Concentration requires a certain bodily attitude; and certain adjustment of your sense organs. Your eyes must be open to the things in the book and not to other things; your ears and other sense organs are, too, in an indirect manner, centered on the book and closed to everything else. This process of adjusting the sense organs so that they will take in what is desired and leave out what is not desired is one of the most essential parts of concentration.

(2) *Concentration is sometimes aided by minor bodily movements.* The true state of concentration is that of bodily stillness or tenseness. When the audience is completely swayed by the speaker, you

"can hear a pin drop" and so forth; when the reader is completely absorbed in his book he is quite motionless. But when the work is difficult and attention is forced, slight bodily movements sometimes help. Lip movements in reading, while they are a very bad habit, are sometimes an aid to concentration. Clenching the fist, walking the floor, fumbling with small objects, all seem to draw off surplus energy that tends to distract the attention. These movements are only observable in cases where great effort is being made at concentration. Facial expressions, the drawn brow, grimaces of various sorts are possible aids to concentration. These all, however, fade away when attention is spontaneous and free.

(3) *Concentration is aided by the mental state of expectancy.* Soldiers seldom go to sleep while standing at attention. The reason is that they expect something to happen every minute. When you are in a state of keen expectancy, awaiting developments, concentration is easy. This is why it is easy to concentrate on a good story. "The popular appeal of the mystery story lies in such questions as are hovering in consciousness as one reads, and each takes its turn in the foreground of attention as the lines of the story furnish clues for

guessing ahead as to the solution. The actual words before the eyes of the reader form merely the basis and crossing-point for the oscillations of attention. For an instant it flashes back to a past incident of the story and reinterprets it, then speculates on the actions of an absent character at that moment, or tries to forecast a solution for some of the various questions still unsettled. Indeed, the interest and attention may be so vibrant over the outcome of these problems that some readers ignore the lines before them and turn to the last chapter to relieve the high-frequency distraction and thus allow attention to subside to its normal swing." The thing that keeps the mind pinned to a story is the number of unanswered questions involved. The desire to know how it is coming out is sufficient to command the greatest amount of concentration. This same set of conditions which hold the attention so closely to a story must be approximated in any reading that requires great concentration. The driest lessons in Latin or Chemistry can be made as interesting as the thrilling mystery stories of Edgar Allan Poe provided the same psychological setting or unsolved problems can be established.

(4) *Concentration requires movements of attention.* The length of time that you can concentrate

on the point of a needle or a single letter of the alphabet or a dot in space can be measured in fractions of a second. Attention shifts rapidly from one point to another. Sustained attention as prolonged concentration does not mean that the mind is glued to a single point. Quite the opposite. There must be either movement in the objects of attention or else something new must be continually seen in them. In reading a story the parts in which there is action are the most interesting. Attention is held with difficulty on the long paragraphs of description, but concentration is easy when things begin to happen. When you are reading for information concentration is conditioned by the number of facts that you are getting. If you are not getting anything, attention lags or shifts off to something else. This is why it is difficult to concentrate when comprehension is hard. Sustained attention to informational reading requires more than merely getting the facts. Reading the dictionary is not an interesting performance because, as an American humorist once remarked, it changes the subject too often. Now, why is it hard to concentrate on the dictionary and easy to pay attention to an interesting story? In each case the object of attention is a series of words. The only difference

is that in the story the words are connected in some way by a plot or theme. This suggests another aid to concentration.

(5) *Concentration requires organization and unity.* Psychologists tell us that it is impossible to concentrate on more than one object at a time. They also tell us that we cannot concentrate on a single unitary object, like the point of a pin, for more than a fraction of a second. These two facts taken together leave us in a bad way. If we can attend to but one thing at a time, and to that a very short time, there is not much hope for us. This paradox is solved by considering the difference between reading the dictionary and reading a story. It is true that we can attend to but one story at a time; but this story is composed of a lot of words and sentences which we attend to in order and for a short time each. The words themselves are of no interest; they become interesting when woven into a story. So what we get is unity with variety in it. The real condition of concentration is "variety in unity." We can attend to but one thing at a time, — this is true. But it can be a great, big, complex thing; so complex that the time may stretch over many hours. Dr. Adams remarks aptly: "Concentration, then, we are to regard as

referring to the whole subject that we are studying at any time. To understand that subject we may have to take now a wide, now a narrow view. But so long as we do not lose sight of the main object we have before us we can claim to be attending all the time. Attention may be diffused as to its area but concentrated as to its purpose." All this means that to be able to concentrate on a book or a lesson the central idea must be clear or the main problem well defined and all other material unified around the main point.

(6) *Concentration requires focusing the mental powers.* The particular object upon which attention is centered at any one time stands out clearer in consciousness than the surrounding objects. This is noticed when looking at a picture or reading a lesson. The particular sentence that is being read is more in consciousness than the one just completed or the one that is to come. You are more conscious of the lesson than you are of the whole book or course, also you are more conscious of the course than you are of other courses, etc., etc. So attention is like a series of concentric circles with the object of concentration at the center. Now the narrower the focus and wider the margin the better concentration is. When by means of a concave glass

the rays of the sun are brought to a focus on a single point, say on the back of your hand, they will soon burn it. As long as the rays are not focused they will not burn. The same is true in a figurative way of the mind. When the mental forces are focused they are effective; when scattered they are ineffective.

(7) *Concentration is also neglecting distractions.* The focusing of the mind on an object or a lesson furnishes one view of concentration. Another view is that of neglecting everything except the object of attention. If you can succeed in keeping out of the field of mental activity all things except those pertaining to the task at hand, concentration is easy. So on the positive side concentration is focusing the mind; on the negative side it is keeping out distractions. This all fits in with what has already been said about attention being selective and a state of preparation. The ability to neglect distractions is very hard to acquire, especially if the distractions have an instinctive pull. Such things as novelty, sudden changes, bright lights, unfamiliar faces and voices, sharp contrasts, rhythm, and cadence, all have a tendency to compel attention. In this case there is competition for your attention. When such competition occurs concen-

tration becomes a matter of selecting the objects of attention and sticking to them through thick and thin. Of course, we do this right along. Of all the external stimuli that our sense organs come in contact with only a few are admitted to the mind. Everything that enters must stand a sort of entrance examination, to see if it fits in with what is going on inside. If it does not, it is turned away. This ability to put all these things that seek admission to the mind through a sort of entrance test is the power of concentration.

(8) *Rapid aggressive work as an aid to concentration.* Once you get warmed up to a subject, concentration is easier. Some students never get warmed up — they quit too soon. Or when they do get going fairly well they quit and lose the value of the momentum gained. Momentum is a great factor in getting heavy machinery to run. The advantage of a fly-wheel is that it gives momentum. Once the heavy wheel gets going it will continue to run for some time after the power has been removed. This gets work done quickly and done well. There is no use spending two hours on a lesson that can be prepared in one hour. Some students find that they can concentrate best when they are working against time, rather than " putting

in" an evening at study. All study is "piece work," to borrow a term from modern industry. Students are not working by the hour but by the job. Of course, the "piece work" basis of study has the disadvantage of encouraging poor but speedy work. This danger is not as great, however, as that of loitering or dawdling over one's lessons. Speed in work is to be encouraged. "The modern world will reward most liberally those individuals who can do, in one hour, or day, or month, what had formerly taken two. The chief training of such accomplishments, as received in school, has usually been the troublesome pupil who allowed the rest of the class to get a month ahead of him, and then in two days crammed up, and to the teacher's disgust, passed the examination with the others." What the student needs is some high-speed assignments that will keep him going strong all the time.

(9) *Outlining as an aid to concentration in reading.* In reading a book it is so easy to let the attention lapse or drift away on some irrelevant matter and suddenly wake up to the fact that you are just pronouncing words and not getting a thing out of it. One of the best devices for compelling close attention is that of making an outline of the

main points in each chapter or paragraph. The technique of note-taking and outlining will be discussed later on. But the very fact that you know you have to get an idea in order to have something to put down on your paper, will aid you in holding your attention on the paragraph.

(10) *Frequent mental recitation is helpful.* Another good "stunt" is to stop at the end of each paragraph and sum up its contents or main ideas in a few words. This merely furnishes a goal to which you work while reading the paragraph. It gives you something definite to work to. More will be said about the value of this practice later.

Concentration and Comprehension. As far as reading is concerned mere concentration of attention on the printed page is not enough; you must comprehend what is there. So studying is not just concentrating, as a kind of mental siege. It is true that comprehension requires concentration and it is also true that concentration requires comprehension. The most practical thing about reading is to improve comprehension or understanding of what is read. How can this be done?

First, Increase your reading vocabulary. Every person has three vocabularies, — reading, writing and speaking. Of these the reading is the largest,

the writing next and the speaking least. It is perfectly obvious that before you can understand what you read you must know what the words mean. The best practical advice that can be given here is for each of you to take an inventory of the number of words the meaning of which you know. There are many good vocabulary tests. These tests give you a rough estimate of the words you know. It has been estimated that the average college graduate should know the meaning of about 14,000 English words. Of course, he uses many less. Milton's poems contain less than 8,000 and the English Bible contains but 6,000 different words. With a reading vocabulary of 8,000 to 10,000 words you should be able to recognize the meaning of 98% of the words that you will run across, except in technical subjects.

There are two or three good ways of enriching your vocabulary. The first is by the study of those languages that are basic to the English. Latin and Greek are the two languages from which most of our English words are ultimately derived. Take any dictionary that gives the derivations and see how many Latin and Greek roots and stems are found. This is especially true of technical vocabularies. The student who knows Latin, Greek and

French has a decided advantage when it comes to recognizing the meaning of new words.

To quote Dr. Adams again: "The best way of enriching your vocabulary is reading. Writing helps, no doubt, particularly in the way of making your knowledge of words more exact. But our first acquaintance with a word should be made by meeting it in active service, not on the retired list as found in the dictionary. In reading your textbooks you will often find that what you are really doing is mastering a technical vocabulary. When you are studying the particular terms used in any subject you are, of course, enlarging your vocabulary and doing it deliberately. We acquire clearness of thought in any subject by analysing the exact meaning of each term. We are, in fact, studying the subject-matter by means of the words that represent it.

"But there is need for a much wider range in the use of words, and this may be acquired in the course of what is called general reading. . . . We may or we may not acquire definite information from this reading, but we do undoubtedly acquire a vocabulary and a certain familiarity with the use of words."

Second, Read always with a problem or question

in mind. Reading is getting an answer to the question you put to the book. Your comprehension of what you read depends partly on how well you have formulated your questions and understand them. This is hard to do. Very often you are told to go to the book and find out what is in it. This is a task and reading is fulfilling the task. If you are reading for pleasure or general knowledge you still have a task but of a different sort. So the first requisite to comprehension in reading is to define your purpose.

Third, Learn to pick out the key sentence in the paragraph. Theoretically, each paragraph should contain one idea or one defined segment of an idea. This idea is usually stated in one sentence and all other sentences are elaborations or expositions of it. Find the key sentence and nail it down. It is often found at the beginning of the paragraph; sometimes it is at the end; sometimes it is tucked away in the middle. Once in a great while it is not there at all. Nearly always the first and last sentences are important because they are either the topic sentences or summary sentences of one kind or another.

Fourth, Verify all doubtful meanings. There is a common tendency of all children and most adults to take the first meaning that the words suggest as

the one intended to be conveyed by the author. Suppose in reading a sentence you run across this phrase, "it was fair day in Syracuse." If you are in a hurry the first meaning conveyed will be that it was "fair weather" in Syracuse. Closer scrutiny will reveal that the real meaning of the phrase is that it was the day of the State Fair. It is astonishing what grotesque meaning a few simple words will suggest to some minds. Indeed, this acceptance of the first suggested meaning is one of the great pitfalls of reading. The wrong meaning is often obtained because of failure to note small words such as "except," "however," "although," etc.

Fifth, Supplement the thought of the writer. A page of print is supposed to be a symbolic representation of an idea or a set of ideas of the writer. The line of words used will only roughly match the line of thought. No writer can *fully* express himself in words. The word is merely a symbol to suggest a meaning. Reading, in a certain sense, is merely a process of supplying the missing links in a chain of ideas. The student who fails to amplify the thought of the writer, however clearly the ideas are stated, fails to get the complete meaning. So reading is thinking; it is active mental

work and not passive absorption. Ruskin made some wise remarks on this point: "And be sure, also, if the author is worth anything, that you will not get his meaning all at once, — nay, that at his whole meaning you will not for a long time arrive in any wise. Not that he does not say what he means, and in strong words too; but he cannot say it all, and what is more strange, will not, but in a hidden way, and in parables, in order that he may be sure you want it. . . . But it is the same with the physical type of wisdom, gold. There seems, to you and me, no reason why the electric forces of the earth should not carry whatever there is of gold within it at once to the mountain tops, so that kings and people might know that all the gold they could get was there, and without any trouble of digging, or anxiety, or chance, or waste of time, cut it away, and coin as much as they needed. But Nature does not manage it so. She puts it in little fissures in the earth, nobody knows where. You may dig long and find none; you must dig painfully to find any.

"And it is just the same with men's best wisdom. When you come to a good book, you must ask yourself, 'Am I inclined to work as an Australian miner would? Are my pickaxes and shovels in good order, and am I in good trim myself, my sleeves

well up to the elbow, and my breath good, and my temper? And keeping the figure a little longer . . . the metal you are in search of being the author's mind or meaning, his words are as the rock which you have to crush and smelt in order to get at it. And your pickaxes are your own care, wit, and learning; your smelting furnace is your own thoughtful soul. Do not hope to get at any good author's meaning without these tools, and that fire; often you will need sharpest, finest chiseling and patientest fusing before you can gather one grain of the metal."

The Speed of Reading. In this connection there are two questions to be answered. First, how fast should a student attempt to read? Second, can the speed of reading be profitably increased? The answer to the first question depends on two factors, the individual and the subject-matter. Some persons read faster than others; some kinds of material permit of faster reading than others. Concerning individual differences in speed of reading, the range from the slowest to the fastest is very great. The very slowest of readers in reading material like history or civics or subject-matter that is not too difficult to understand, read more than 200 words per minute; the fastest readers on record can go

about 800 words per minute. The way to test your own speed of reading is to time yourself on the reading of five or six pages and then count the number of words read. You will find that you vary depending on the degree of comprehension and on the kind of material. There are certain things that demand rapid reading and others that demand slow and careful work. But it is not to be assumed that rapid readers are superficial. Indeed, they are almost always profound. Text-book work, especially advanced lessons, requires slow reading. Slow reading is demanded when you are reading the statement of a problem in mathematics, or reading the directions for a laboratory exercise in science. Rapid reading is necessary in reviews, in skimming over a reference book for a particular point, in reading a lesson in advance for the purpose of getting the main ideas. Whether or not it is best to read rapidly or slowly depends entirely on the purpose for which you are reading.

How To Increase the Speed of Reading. We said a while ago that increasing the speed of reading does not decrease comprehension, but rather increases it. Psychological experiments on this point bear out the conclusion. Thus increasing speed is a good way to increase comprehension. How is the

speed of reading increased? Before attempting to give practical advice at this point it is best to show the facts on which speed of reading depends. In the first place it depends on the speed with which the eyes are moved along the line. The eyes do not move smoothly along a line and then jump back and glide along the next and so on. What happens is that the eyes jump from point to point, like a frog hopping down a path. They fall on one point and take in an "eyeful"; when this is comprehended, they jump to the next point ahead and take in another "eyeful" and so on. The psychologist Woodworth says: "In reading, the eye moves by a series of short jumps from left to right along the first line of print, makes a long jump back to the beginning of the second line and another series of short jumps along that line, and so on. To appreciate the value of this jerky movement, we need to understand that each short jump occupies but a thirtieth to a fiftieth of a second, while the 'fixation pauses' between jumps last much longer, with the result that over ninety per cent of the time spent on a line of print is fixation time, and less than ten per cent is occupied in jumping from one fixation to the next."

From this it follows that the way to increase the

speed in reading is either to decrease the number of jumps by making the "eyefuls" bigger or by decreasing the fixation time of each pause. The length of the "fixation pauses" depends on the readiness of the mind to take in that eyeful; the size of the eyeful depends on the same thing. It is interesting to note that these fixation pauses are not centered on each word, but they jump from phrase to phrase. This gives a clue to the way to increase the speed of reading. The rapid reader does not read words, but whole sentences at an eyeful. At first when reading is difficult each word must be noticed; later it becomes possible to make the phrase the unit, and later the sentence, and some omnivorous readers claim to be able to take in a whole paragraph at a single eyeful. Indeed, learning to read rapidly is a process of passing through several successive stages. First the letter stage, then the word stage, then reading by phrases, then by sentences and finally by paragraphs. Most students never get beyond the "word stage" of reading. By a little practice you can soon learn to read by phrases and then by sentences.

Kinds of Reading. The kinds of reading that most college students do can be grouped under four heads. (1) Textbooks, (2) Collateral or supple-

mentary reading, (3) Recreational reading, (4) Reference reading. A word should be said about each of these. A textbook is supposed to contain the essential information of a given subject put in such a way that the student can grasp it. Unfortunately many textbooks do not consider the student at all. Others do consider him and present the material from his point of view. Students' attitude toward the textbook varies greatly. Some regard textbooks as containing tasks to be performed and work to be done. As long as they get the lesson and understand what is in the book they consider that they have done all that is required. The real purpose of a textbook is not so much to furnish you final information as to inspire and guide your study. Whatever may be the case textbooks are usually very much condensed and should be read carefully and more than once.

Supplementary or collateral reading is required in many college courses. Here one must read fairly rapidly in order to cover the ground. One must also read carefully in order to be ready for quizzes. The best way to do this sort of thing successfully is to know first of all what you want to find out in the collateral books and go after these particular points. Of course, you will have

your trusty note-book along to take down any important points. Be sure that you get all the important points, without spending too much time on the details. In such reading as this the "sentence reader" will always excel.

Recreational reading consists of reading poetry and fiction and anything else that is read for the pure enjoyment of reading. Here reading should be leisurely. Reading for appreciation should never be faster than normal rate.

Finally, students do a great deal of reference reading, such as encyclopedia articles, magazine articles, and general surveys of books. All this sort of reading can be done rapidly because in doing it, one usually is looking for some special sort of information and all other matter can be skipped over as soon as its irrelevance is found out. Students who are not already familiar with dictionaries, encyclopedias, books of reference of various sorts, should make a tour of the library, and see what is there. How to use these books will be explained by the library attendants.

Mechanical Aids in Reading. First of all every book has a table of contents and most good books have an index. These appendages are there to aid the student in his search for knowledge. An old

college professor used always to give an examination that required the use of the index or table of contents just to see how many students would take advantage of them. Second, such features as indentation of paragraphs and different sizes of type are used not to decorate the page but to aid the reader. Paragraphing for example is a very great aid in reading if the student knows how to take advantage of it. Third, summarizing paragraphs and making brief outlines are very great aids to reading. The technique of outlining and note-taking will be explained later on.

Underscoring and Marginal Notes. It is a common practice for students to underline what they regard as the important sentences or phrases, or to make notes in the margin. This is a fine thing to do, provided wisdom is exercised in doing it. In the first place a sentence should never be underlined until the whole paragraph has been read. Do not make the mistake of underlining as you go if you are reading it for the first time. Mistakes are bound to occur and you will find later that you have not underlined the essential sentence at all. Secondly, underlining should not be overdone. Obviously if you underline everything you have gained nothing. It is even doubtful if it is good

psychology to underline all the sentences in one paragraph. Stick close to the essential points.

Instead of underlining some students use an elaborate system of symbols to indicate various things. Such symbols as (), or $\surd$, or $=$, are used through the text to stand for different ideas. Such a system is not recommended for most people simply because it is too complex.

Marginal notes are good things also, provided they are not overdone. The margin may be used for the following purposes: (1) For noting criticisms or suggestions, (2) For jotting down further questions that occur to you, (3) For cross references, (4) For summarizing, (5) And, if wide enough, for a rough outline. The margin and the flyleaves of your books have great possibilities. Here you can put your questions and comments, opinions and criticisms, or even summaries for future use. Later in life a book so marked and annotated is of very great value to you.

Chapter VII

THE MEMORY TYPE OF STUDY

The Importance of Memory in Study. Memory is the basis of all knowledge. It is true that *learning* involves other things beside memory, but memory is the ultimate foundation on which all learning is built. In every college course there are a number of facts that must be memorized in one way or another. The student with a good memory for facts is always at a decided advantage in any college examination. In spite of all that has been said against "memory" examinations and in spite of assertions of professors that their examinations require application of knowledge rather than a reproduction of facts, it is nevertheless true that all examinations require a knowledge of facts. Of course, different subjects require different degrees of memory. Courses in history, natural science and social science require more memorization of facts than courses in English or foreign language or mathematics. Indeed, courses like geometry, for instance, forbid the use of memory as a substitute for reason, but even here certain axioms, postulates,

and principles must be remembered. In fact, memory is the basis of reasoning. For how could you reason if you knew nothing about the subject. To reason out the proposition that the three angles of a triangle equal 180 degrees requires a knowledge of certain very definite facts.

Memorizing as a Type of Study. Memorizing is a form of learning, but not all learning is memorizing — there are other forms. Memorizing is also a type of studying, but not all studying is memorizing. There are, however, certain types of mental work that require memory exercise. In languages, for example, a vocabulary must be memorized. Of course, there are other and probably better ways of learning a vocabulary than sheer rote memory but in the last analysis they all boil down to the same thing. Courses in English often require that certain passages in prose and bits of poetry be committed; in mathematics certain theorems, formulae, rules, etc. must be memorized; in science there are hosts of facts that must be learned in this way; in history, economics, sociology and other similar subjects memorizing is a prominent factor. These considerations make it imperative that memorizing be included in our list of types of study methods.

Can Memory be Trained? Students who complain of having a poor memory usually have foundation for a good memory but are using poor methods. Memory training thus turns out to be training in methods of memorizing. A good memory is a good method, and a poor memory is a poor method. On the other hand, there are cases in which memory seems to be a gift rather than an accomplishment. There are persons in whose minds things seem to stick and there other minds in which nothing will stick. But when we talk to the persons with good powers of retention we find that they are constantly using them. This makes us suspicious, at least, that memory is a matter of practise.

How to Diagnose Your Memory. In making physical diagnoses the physician takes his leads from certain symptoms exhibited by the patient. The same method holds good in mental diagnoses. A good way to improve your memory is to analyze your methods of memorizing and note the results. In the first place, do you have trouble in memorizing facts? Does it take you a long time to memorize a simple poem? Do you have difficulty in getting facts into your mind? Or do you learn easily enough but forget rapidly? Does your memory fail you in a crisis? That is, can you remember

facts well enough except on examination? If you have trouble in memorizing, your difficulty is probably a bad method; if you have trouble in holding facts in your mind, the difficulty is with retention; but if you are able to retain things but fail to reproduce them in crises, your trouble is with recollection.

Memory is a Four-Fold Process. A complete act of memory seems to involve at least four distinct processes. (1) There is the process of memorizing or getting the facts in mind; (2) The process of retention, or holding them for future use; (3) The process of recollection or reproducing them when you want them; (4) The process of recognition or that of identifying them as the ones you wished to recall. Now any one of these four processes may be poorly developed or mal-adjusted. Of course, they are not separate and distinct but each work in harmony with the others. Thus in making a diagnosis of memory these four factors must be kept in mind, for the trouble may lie with any one of them.

Methods of Memorizing. Like everything else there are good and bad methods of memorizing, the value of any method being always tested by the results. The average college student should seek those methods that give the kind of results he desires. For instance, if you wish to memorize a series

of facts for the purpose of reproducing them on an examination, you should employ certain methods; on the other hand, if you wish to memorize facts with a view to making them a part of your mental equipment, you should use different methods.

Mechanical and Logical Methods. All methods of memorizing may, for the sake of convenience, be grouped under two heads. The mechanical methods include all forms of memorizing by "brute force" — so to speak. Logical methods are those in which the material is learned by understanding its meaning. Memorizing a sentence in a foreign language without knowing its meaning is a case of mechanical or rote memory; another example is that of memorizing the proof of a theorem in geometry without understanding it. These are extreme cases. There are other cases in which the understanding is partial. In fact, we may say that any method is mechanical or logical to the extent that it involves an understanding of the material to be learned. The two methods are often combined when dealing with difficult facts.

Mechanical Methods. Some of the more common mechanical methods will be mentioned here.

(1) *Visualization.* Some persons have the power of memorizing by getting a vivid mental image of

the facts as they appear in print. Suppose you wish to memorize a poem. The visual method is to get a mental photograph of it as it appears in the book or on the paper from which it is read. When you are ready to recite all you need is merely to remember how it "looked" and read right off from your mental picture. The same can be done with sounds. Music can be remembered by recalling how it sounded when played on a certain kind of instrument. But the auditory method is rare in college work.

The chief objection to visualization as a method is that these pictures fade away very quickly. It has the advantage of being a quick and easy method for "hurry up" jobs with no permanent advantage. It is an excellent method of cramming for an examination in which it is your purpose to forget the whole thing when the examination is over. It also has the advantage of helping you out when you are required to memorize something that you cannot possibly understand. But we cannot recommend the method to you simply because the material so memorized is soon forgotten. The picture method of learning is all right in the kindergarten but it is too juvenile for college.

(2) *Code Systems.* Many of the so-called mem-

ory training courses by correspondence are based on a code system. You are required to memorize a list of more or less disconnected words. These words are usually concrete nouns. Such as cow, can, cup, hat, hoe, heel, etc. There are one hundred or more words in the list and you are required to memorize it. After you have learned your code list, or lists, for there may be several, you are ready for business. Suppose now that you wish to remember some facts in history. The first you connect with your first code word, the second with the second code word and so on. You are able to recall your facts by recalling the code words. This method of memorizing is worse than useless and cannot be recommended to college students for any kind of memory work.

(3) *Acrostics.* This is a scheme of arranging the material to be memorized so that the initial letter in each word will spell some well-known word; or so that the initial words in each sentence will make some other sentence. Suppose you desire to memorize a list of names of plants. By careful manipulation you will be able to arrange these names so that the initial letters will spell some word. Often it is possible to let words stand for whole sets of facts and when the words are memorized in this fashion they

will suggest the facts they represent. This method is recommended for difficult material.

(4) *Rhythm.* It is a common observation that poetry is easier to remember than prose; that the words of a song can be recalled when the tune is remembered; that children have a tendency to "sing" whatever they are trying to memorize. These observations suggest that rhythm or metre is an important factor in memorizing. No doubt many of you resort to rhymes of one sort or another to remember some commonplace facts. A good example is the number of days in each month. Ask the average person how many days there are in the current month and he will repeat, either to himself or aloud, something like this:

"Thirty days hath September, April, June and November,
All the rest have thirty-one, save February which in fine,
Hath twenty-eight, and leap year gives it twenty-nine."

It has been said that certain of the pioneer schoolmasters taught the multiplication table by having the pupils sing it to the tune of "Yankee Doodle."

There are numerous poems in existence designed for the purpose of aids in learning the names of the Presidents, the states of the Union, the countries of the world, and so on. It is doubtful if college students can profit much by the use of this scheme of memorizing. Except for committing poetry and other material that has a natural metre, it cannot be recommended.

Logical Method of Memorizing. Strictly speaking, logical memory is that in which the material is learned by a complete comprehension of it. But often this is not enough. It is entirely possible to comprehend and still not remember. There are certain devices which are called logical, in contrast with the mechanical devices, because they are less artificial.

(1) *Observe Relationship.* Nearly all the facts that you will need to memorize will have certain relationships existing among them which if analyzed will make memory easy. For example, the 1920 census gives the population of Syracuse, N. Y., as as 171,717, three seventeens in a row; the height of Pike's Peak is 14,147 feet, two fourteens and a half. Any kind of facts that are expressed in figures such as dates in history, statistics, etc., can be easily memorized by such observations. One of the quickest ways of memorizing vocabulary is by noting rela-

tionship with words already known. For instance, in Hallquest's *Supervised Study* we find the following suggestions:

English	*Intermediate relations*	*Latin*
Man	Married man — home	homo
Garret	storeroom — grain store	granaria
Suitor	Prince Charming — wooed by proxy	procus

		German
Voice	voice lozenges — stimulation	stimme
Potato	dig up — cart off	kartoffel

Or using a somewhat different scheme:

mensa — "men sat" (table)
puella — "ella" (girl's name)
satis — "satisfy" (enough)
unbegründet — underground
geschworen — swore

Of course, it is not always easy to find these relations. Some of them are also far-fetched. But still the method is a very handy one and will work for much of the vocabulary that you will need to learn.

(2) *The Recitation Method.* The above method applies better to memorizing vocabulary than it does to learning the main facts of sciences, or essential points in a book. If your task is that of "getting" the facts or principles stated in a textbook, other methods should be employed. The recitation

method is simply that of checking constantly on what you have learned. After reading a paragraph, close the book, and compel yourself to recite the main points. If you cannot do it at first, read the passage again. Keep on until you can recite it. Not in the words of the author, of course, but in your own words. This presupposes a complete understanding of the material to be learned. One good reason why you cannot recite in class is that you have had no practice in reciting that material. This constant private recitation not only gives you practice in doing the thing you will be called upon to do later, but it also aids you in checking up your weak spots. When you "go over" a thing in your mind you can quickly determine the parts that require further study. This enables you to concentrate your energies on the points where effort is most needed. Mental recitation compels concentration of attention. There is a vast difference between merely "reading over" a lesson and studying it. If you go at your books with a consciousness of the fact that pretty soon you will call on yourself to recite what you have read, your method of attack will be different and you will put more effort into it. The mental recitation method is very difficult at first. But once the habit is acquired it is one of the most valuable aids to

study. We strongly urge that every student begin to use it at once.

(3) *Organization and Outlining.* When the amount of material to be remembered is great, there is no better way than that of preparing an outline of it and memorizing the outline. Suppose you are preparing for an examination on a certain book. First read the book carefully for the purpose of understanding it thoroughly. Then go back and outline it. It is often best not to use the author's outline, if he has one, but to make one of your own. Sometimes it is necessary to reorganize the material completely for the sake of outlining it. Methods of outlining will be discussed in a future chapter. Your outline should not be too detailed, nor too sketchy. Be sure that you get all the facts. If you have followed the logical rules of organization, you should have no difficulty in memorizing your outline. First, go through and get the main heading, then the first order of sub-heading, then the second order and so on. If there are more than five or six main headings, or more than five or six sub-headings under any main head, it might be well to use some artificial scheme of memorizing them. Your rule, however, should be to use mechanical methods only as a last resort.

Some Practical Suggestions for Memorizing. It is obvious that the method used for memory work should depend on the kind of material to be learned. Memorizing the "substance" of a book is a different task from memorizing vocabulary, which is different still from learning a poem. For the sake of convenient discussion we may divide the material into two general groups. In the first group we have such things as outlines, poems, sequences of facts, and all material that is organized into a system, all that is coherent and logically arranged. In the second group we have all disconnected facts such as items of vocabulary, mathematical formulae, etc. The first we shall designate as connected material and the second as disconnected.

Hints for Memorizing Connected Material. As a specimen of this sort of material take a history assignment which requires that a certain number of pages be read and "learned" for the purpose of recitation and examination.

(1) *Make a Rapid Preliminary Survey.* First get a bird's-eye-view of the assignment by looking over the paragraph headings if there are such; if not, read over the first and last sentence in each paragraph; or at least read enough to give you a general impression of what it is all about. This will

enable you to size up your problem and know just what you have ahead.

(2) *Be Sure that Your First Impressions are Clear and Accurate.* Things will be recalled as they were learned. If your first impressions are wrong they will remain so until checked up and corrected. These first impressions should not only be accurate but also vivid. The vivid experiments are usually the ones we remember longest.

(3) *Master the Assignment Thoroughly before You Attempt to Memorize.* Your attention has already been called to the fact that when a thing is thoroughly understood it is more than half memorized. A good rule to students would be "*Never Attempt to Memorize a Thing You do not Understand.*" By understanding we mean clear comprehension which was discussed in the previous chapter. Complete comprehension means mastery of details. It is too easy to skip over hard words or difficult points by promising yourself that you will "return" to them later. Don't do it. Clean up everything as you go, if it takes you a month to do it.

(4) *Organize Your Material into an Outline.* By all means establish the habit of outlining everything. Even if the assignment is already outlined, do it again your in own way and in your own words. Let

your outline be simple but comprehensive. Be sure that it contains all essentials and all important facts.

(5) *Select Carefully the Parts to be Memorized.* Do not be so foolish as to attempt to memorize an assignment word for word; do not even attempt verbatim memory of your outline. Pick out the "big ideas," the important principles, the outstanding facts, and commit these to memory. There are certain facts that you should keep "mentally on tap" so as to be able to recall them at a moment's notice. There are other facts about which you need to know only where they can be found. The lawyer for example, keeps always in memory the more fundamental and more necessary points of law, but there are literally hundreds of fine points that he cannot hold in memory though he knows instantly where to find them. Instead of cramming your head full of facts that you will not frequently use, you should simply keep them in a convenient place for handy reference.

(6) *Learn Your Lesson as a Whole and Relate it to Other Lessons.* We have already mentioned the fact that a course in college is not just a series of lessons or assignments strung together like beads on a string. A lesson is simply a convenient division of

a whole body of facts and nothing more. Most lessons, or assignments are more or less unitary and should be studied as such. All connected and organized material should be learned as a unitary whole and not a bit at a time.

(7) *Complete Each Assignment in One Sitting if Possible.* Psychologists say that spaced learning is better than unspaced. But this refers more to disconnected material and material of considerable length. It is also intended to emphasize the necessity of frequent and spaced reviews. But practical experiences tell us that to study a history lesson for five minutes and rest five, then go back to five more minutes of study and so on, would be very wasteful of time to say the least. The kind of memory work we are discussing here requires the job be completed before adjusting the mental machinery for another.

Hints for Memorizing Disconnected Material. As a specimen of this sort of memorizing take a foreign language vocabulary. There are, of course, two ways of learning a vocabulary. One is to go ahead with translation and look up each new word as it occurs; the other is to take a list of the foreign words and their English equivalents and memorize each pair. Both methods ultimately turn out to be memorizing disconnected material.

(1) *Memorize it by Parts.* Here is a case where the general rule that material should be memorized as a whole will not hold. Vocabulary should be learned a word at a time because that is the way it is used. Obviously it would be a foolish undertaking to make a rapid survey of a Latin dictionary for the purpose of getting a "bird's-eye-view" of it.

(2) *Space Your Time.* Here is a place where spaced learning is far superior to unspaced. You cannot learn all your vocabulary in one sitting. No rule can be given as to the length of time you should spend studying vocabulary before resting or taking up something else. Probably 15 minutes to 30 minutes is long enough for most students to spend at one sitting.

(3) *Learn with the Intent to Remember.* This applies to all kinds of learning but it has a special application here. When you learn the meaning of a foreign word strive to make that meaning a permanent possession. Too many students "look up" words in a dictionary for the purpose of completing a gap in the translation and not for the purpose of remembering it. In general, if you learn a thing for the purpose of repeating it in class, you will remember it until that time and straightway forget it. On the other hand, if you learn it for the sake of

remembering it a lifetime, it will stay with you much longer.

(4) *Make Your Own Dictionary.* This has a two-fold advantage. In the first place, the very fact that you *write* a thing helps you to remember it. Memory seems to be motor as well as mental. The other advantage is that it gives you practice on your difficult words. Public school teachers say that there are certain English words known as "spelling demons"; so-called because they are simple words but hard to spell. In the same way you might keep a list of your "Latin Demons," "German Demons" and so on, and keep working on these until they are learned.

Remembering. So far we have been dealing with how to memorize. Now we shall consider two other important phases of memory. First how to retain what you have learned and second, how to recall it when you need it. Our practical experience convinces us that we do not retain all that we memorize; and science has proven that we cannot recollect all that we retain. Let us consider these separately.

How to Retain What Has Been Learned. We are not concerned here with the very interesting psychological problem of what retention is, or what goes on in the brain when we remember. All we

want to know is whether or not there is any way by which we can make facts stick in our minds after we have gone to the trouble of learning them. It is true also that retention is not a type of studying but rather a check on how well the memory type of studying has been carried on. This gives a clue to how to retain.

(1) *Retention Depends on How Well the Material was Learned.* By "How Well" we mean the degree of perfection of the memorizing. If the material was half memorized it will be less than half retained; if it was completely memorized, that is, learned so that it could be repeated one time accurately, it will be something less than fully retained. In order to get full retention, for any length of time, the material must have been over-learned in the first place. Memory seems to be a field in which you reap what you sow; or on many occasions you reap considerably less than you sow. In order, therefore, to reap a bountiful harvest you must do a good job of sowing.

(2) *Retention Depends on the Length of Time between Learning and Attempt to Recall.* If there is no practice in between, the amount retained becomes less and less as time goes on. In the first few hours after learning you will lose from about 10 to

60% of what you learned, depending on the kind of material it is and how well you learned it; then in the next few days you will gradually lose less and less until by and by you will lose all that you are going to, provided there is anything left. Or to state this in another way: if you can retain it for an hour, your chances are good for retaining it for a day; if you hold it a day, you can for a week; if for a week, then a month, and so on.

(3) *Retention Demands Constant Practice or Application.* This is seen clearly in the case of mathematical principles and formulæ. About the only way to remember mathematics is to use them. For example, it was found that in a class of fifty college seniors there were only five who could extract the square root of a five-place number. And the five who could do it all testified that they had had occasion to use square root several times since the days of arithmetic when they all learned it. What is true of mathematics is true of other subjects to a greater or less degree. The fact that retention demands constant application or practice, makes frequent reviews imperative. According to the general law of retention stated above, it would seem that reviews should be more frequent following the learning period than later.

(4) *Retention also Depends on the Method of Learning.* Material learned by logical methods is usually retained longer and better than material learned by mechanical methods. The student who complains of his inability to retain what he has learned should check up on his methods of learning before blaming his failure on an inborn "bad memory."

(5) *Retention Depends on the Kind of Material Learned.* Material that is connected, organized and logically arranged is retained much better than disconnected, unorganized material. The reasons for this have already been stated.

(6) *Retention does Not Depend on the Rate of Learning.* There is a popular notion that the length of time a fact is retained is proportional to the time spent in learning it. This is not true. For a fact may be learned by a good method in a short while and retained much longer than a fact learned by a bad method in a long time. Modern psychology denies the statement that quick learners are quick forgetters.

How to Recall What You Have Retained. The fact that you have retained a fact does not mean that you can recall it when you want it. You may recall it at some later time or you may relearn

it in less time than it took you to learn it in the first place. Suppose now that you have memorized your material by some good method and in such a way that you have retained most of it, under what conditions will you recall it or fail to recall it?

(1) *Recall requires a Stimulus.* Suppose you are trying to recall the condition of the weather a week ago today. First you will try to remember something that happened on that day hoping that this particular event will somehow be connected with the weather. There is nothing in your present experience that is connected with that past event; but there probably is something that is connected with some other factor back there which in turn is connected with the thing you want. Indeed, trying to recall some past fact or event is largely a matter of seeking clues and following them out. If you desire to recall the general part of some lesson that you have learned a while ago, you will try to recall the general outline, or the time and place of learning, or the general conditions that obtained when you learned it. In short, the "setting" is the stimulus which produces the desired response.

The clue sought takes various forms depending on the method of learning and the kind of material learned. Sometimes a good clue is the opposite to

the fact desired. This is because things are likely to be connected with their opposites or with something standing in contrast to it. Or on the other hand "things similar" to the thing desired may serve as helpful suggestions. Again, facts that were learned in series are suggested by the preceding item in the series. A good memory often consists in this very ability to find the proper clue and find it quickly.

(2) *Recall Requires Organization of Knowledge.* Memory has been compared with a filing system. A good memory is said to be analogous to a good filing system by means of which desired information may be obtained at once, provided, of course, it is on file. This is merely a figure of speech but it is helpful in understanding why we should keep our knowledge arranged in an orderly fashion. The reason why some clues do not get us what we want is that they are not connected with it. The way to insure speedy recall of any fact is to connect it with a large number of different other facts and ideas. So if one connection fails to work, another may be used.

(3) *Concentration Aids Recall.* It is said that persons in hypnotic or semi-hypnotic states are able to recall facts that they otherwise could not. These abnormal states are simply exaggerated conditions of

attention in which the whole mental force is centered on one thing. By a little practice a student may be able to do this to a limited extent. It is not recommended, however, as a sure means of recollection.

Failures to Recall. Further suggestions on how to bring to mind desired information are gained by considering the cases in which we fail to recall. Inability to recall facts that you know you have fixed in mind may be due to a variety of causes.

(1) *Failure to Recall because of Some Mental Resistance.* This is best illustrated by the common and tantalizing experience of trying to recall a well-known name. The name is "on the tip of your tongue" and "you know it as well as you know your own" but still you cannot say it. So you resort to all sorts of devices to get it. You may go through the alphabet hoping that when you strike the initial letter it will serve as a clue. This may fail; it often does. You try other means; but the harder you try, the worse the situation becomes. Finally you give up in disgust. At some later time, and at some unexpected moment, the name "pops" into your head. Now the trouble was that some other name or other word was "interfering" or "inhibiting" it and when the inhibiting agent disappeared the name came back at the call of some slight stimulus. The

practical lesson here is that in all such cases the thing to do is to let the matter rest for a while and it will take care of itself.

(2) *Failure Due to Excitement or Worry.* Any emotional state usually spells defeat to recollection. A sure way to forget is to become worried or excited. Students often "go to pieces" on an examination and forget everything; debaters often forget the important points. Some temperamental students become mentally paralyzed when the teacher calls on them to recite. The reason for all this is that emotions upset the whole mental equilibrium. The remedy is to keep cool on all occasions. Another aid is to trust your memory. The moment you lose faith in your ability to recall and become afraid that you will forget, the fear causes you to forget.

(3) *Failures Caused by Being on the Wrong Track.* One common cause of mistakes in memory is that of misunderstanding the directions, or ignorance of what is wanted. If you wish to recall a fact learned in some previous lesson and you search in the wrong lesson, you will be sure not to find it.

Chapter VIII

COLLECTING AND ORGANIZING INFORMATION AS A TYPE OF STUDY

College Work Requiring this Type of Study. Collecting and organizing information may be an important part of every college course. The amount of this kind of work that is required depends on the nature of the course and the teaching methods of the instructor. Indeed it is possible to arrange the subjects according to their demands for assemblage and organization of data, putting the natural sciences at one end of the list and mathematics at the other. In mathematics study is mainly problem-solving; in laboratory science it is a matter of gathering facts and organizing them into systems. So science requires a maximum of this type of study, mathematics a minimum, and the other subjects come in between. Certain kinds of work in English, as for example, essay-writing, may require that you first collect your data and then organize them in your paper.

The succeeding years of college work require more and more of this type of study. Aside from science courses the freshman year does not demand much in this way; the sophomore year requires more and the junior and senior years require a great deal. In the advanced courses in any subject the students find it desirable and necessary to do a considerable amount of searching for facts not contained in textbooks. Indeed, graduate courses are all fact-collecting courses rather than fact-dispensing courses. Research is the highest stage of study, and this type leads directly to it.

The Advantages of this Type of Study. One very distinct advantage has just been hinted at in the last sentence above, that this kind of study leads to research. Now research means securing first-hand information whenever it is possible. In the laboratory you will come in direct contact with nature in the same way as the greatest scientist in the world and have the same opportunity of observing nature's ways and the same opportunity of formulating theories concerning her laws. Perhaps this statement is a bit optimistic but it is intended only to emphasize the point that this type of study brings you in first-hand contact with the facts.

In this type of study you learn by doing. Infor-

mation that you dig up for yourself is more apt to be remembered than that handed to you gratis. Furthermore, laboratory work makes the facts more vivid. To be told that two parts of hydrogen combined with one part of oxygen form water is not half as impressive as the actual performance of the experiment.

Again it can be said that gathering and organizing data promotes the spirit of independence and initiative in intellectual work. The student who develops the habit of finding out for himself rather than taking the word of another is laying the foundation for great intellectual achievement.

The Technique of Collecting Information, Note-Taking. Careful and well-selected habits of note-taking are indispensable. The note-book is a prominent and important factor in college work, for scarcely a day passes when some notes are not taken. The gross business done in note-taking in a day in any American college is usually very large since every course offered either requires notes or permits them, and practically every student goes armed with one or more note-books.

The Purposes of Note-taking. There are two main reasons why students take notes. First, to record and preserve in a condensed form certain

ideas and facts. The motive here is simply that of collecting and arranging selected bits of information so as to make them available for future use. Second, notes are taken as an aid to study. Note-taking aids study in two ways. First, it is a stimulus to concentration and comprehension in reading; and second it helps memory by simplifying and condensing the material. In the chapter on Reading, we showed how outlining and note-taking aids reading; and in the chapter on Memorizing, we show how it aids memory.

At this point a word of caution is in order. Note-taking may become a hindrance rather than a help to study. It becomes a hindrance when it is made a *substitute* for study. Rather than read closely and comprehend the meaning, the student copies down a few sentences in his note-book; rather than remember certain important facts, he writes them in his note-book with the good intention of memorizing them later. This is a thoroughly bad practice for it defeats the very purpose of note-taking.

The Uses Made of Notes. The uses which are to be made of notes determine, to a certain extent, the kind of notes to take and the way to take them. For this reason you should distinguish the following uses that may be made of notes.

(1) To prepare for recitations and examinations.
(2) To prepare for writing a theme, essay or speech.
(3) To fulfil the requirements of certain courses. For example, most science courses require a note-book.
(4) To use for reference later in life.

The first two uses require that the notes be legible, orderly and in convenient form. They may be made in pencil and need not be in a note-book. If notes are taken preparatory to writing a theme, essay or speech, they should be on small cards or pieces of paper so that different arrangements of them may be quickly made. If they are for purposes (3) or (4), they should be neat, orderly, in ink, and arranged in a note-book according to some standard scheme.

Sources from which Facts are Collected. The information which students collect in college comes largely from three sources. First, books and written material; second, lectures, recitations and oral material; third, observations and laboratory work. The technique of collecting and organizing data from each of these three sources is somewhat different and each requires separate treatment.

A. How to Gather Facts from Written Sources.

In harvesting data from printed material there are certain definite steps to be taken.

(1) *Know Exactly What You Want.* This is so obvious that it could be pre-supposed. Most students go to the library with a purpose in mind. But this purpose may be more or less indefinite and vague. We merely urge that you have it clearly defined, — that you know what *specific* information you are after.

(2) *Know Where to Begin Looking.* This involves knowing how to use the library. Since nearly all college libraries in America are arranged according to a standard scheme, but differ in important details, it is possible to state only general directions. For most information there are three places to begin looking. (1) In the library catalogue, (2) In some classified index, (3) In an encyclopedia or book of reference. In most libraries the catalogue is a straight alphabetical file of cards, with one card for each book or periodical. These cards are arranged alphabetically according to authors and titles. It is a very simple and easy matter to use a library catalogue. It is much more

difficult to learn how to use the various classified indices. The articles contained in nearly all periodicals are classified and indexed in certain other publications. There are a great number of these. Poole's index is a famous starting place for articles of a popular and general nature. The scientific journals carry special indices. For example, all important articles on psychology are catalogued in the "Psychological Index." It is impossible to list here all the special indices. You are advised to state your wants frankly and freely to the library assistants and they will show you how to use both the catalogue and the indices to periodicals.

The third place to begin looking is in the encyclopedias and standard books of reference. There are several good encyclopedias which contain articles on all important topics. In addition to general works like the Britannica, there are encyclopedias on special fields as for example "The Cyclopedia of Education." Then there are all sorts of handbooks and manuals of information. A fairly complete list of library indices and books of reference is found in a little pamphlet called "Guide to the Study and Use of Reference Books," by Alice B. Kroeger. This book is on reference in most college libraries. A great many colleges and universities

publish a handbook on how to use their particular library. The freshman should inquire if there is such a book and secure a copy for personal use.

(3) *Know How to Follow Up Clues.* It is not likely that all the desired information will be found in any one place. Encyclopedia articles usually contain a set of references to books and articles on the same subject. They also contain references to kindred topics. Students often have difficulty in finding the heading under which the desired information is contained. For example, a student wishing to write a theme on "American Holidays" will be at a loss to know whether to look under "American," or "Holidays," or the name of specific holidays. Reference work of this nature must be of the trial and error sort.

(4) *Know How to Evaluate Material.* This must always be done according to your purpose. If you are looking up historical material for the purpose of making a chronology, you will pay most attention to dates; but if you are outlining a section of history for an examination and know beforehand that dates are not important, you will tend to neglect them. Digging information out of books is somewhat like digging gold out of the earth. It is necessary to dig up a lot of dirt to get a little

gold; it is further necessary to recognize the gold when you see it. After a while you may acquire skill in getting the maximum amount of gold and the minimum amount of dross. It is an art to be able to skim an article, get out all there is in it for your purpose, and neglect the rest.

(5) *Know How to Take Notes on Written Material.* The methods of note-taking on written material depends on the use to be made of the notes. If the purpose is to extract specific ideas or facts to be used in a theme, essay, or speech, all that is necessary is to pick out what you want and jot it down either in your own words or the words of the author. The only requirements are to know what you want; how to recognize it, and how to record it so that your notes will have meaning when you are ready to use them. We have already pointed out that such notes should be taken on small cards or slips of paper.

If the purpose is to condense the article into an outline, or to make a brief, or synopsis, or abstract of it, then note-taking is a different procedure. The steps in the process are the following:

a. Make a rapid preliminary survey of the material with a view of finding the outline, if there is one, or at least to finding the leading ideas.

Most written material follows some sort of an outline which may stand out boldly or may be hidden in the text. There are many different kinds of outlines with which you should be familiar.

b. Having discovered the leading lines of thought the next step is to use these in a *tentative* outline. It is always best to let your first outline be tentative because you may discover, upon more careful examination, that your first impressions of the main ideas were wrong.

c. The next step is to read the material carefully for the purpose of getting the details with which you fill in the outline. Here you will encounter the problem of knowing how full to make your outline. Obviously you cannot include everything. One suggestion is that you put down the main ideas and omit all the facts and illustrative material. Another is that you include as many of the facts as your purpose seems to demand. Remember always that you are reading and outlining for a purpose and this purpose should control what you do.

d. The final step is to test your results to see if you have really accomplished what you set out to do. Every paragraph of print is supposed to contain a single idea, or a homogeneous group of

ideas. The main idea of the paragraph may not be expressed in a single sentence. Hence the danger of relying on quotations. But the idea is usually capable of being expressed in a single sentence and that becomes the task of the note-taker. To check this matter thoroughly it is often necessary to read through the article a third time. Such a checking will often reveal the fact that you have indulged in long quotations which are not to the point, or that you have summarized the ideas in terms that are too sweeping or too general. A test of good notes is whether or not a person unfamiliar with the material they cover could read them and get the main ideas.

B. How to Gather Facts from Oral Presentations

By "oral presentations" is meant lectures, recitations, and discussions. Here note-taking is a task different from that of abstracting written material. Some of the points to be observed in taking notes on lectures are as follows:

(1) *Do Not Get in a Hurry.* Most lecturers on college subjects follow well prepared outlines. Many of them will announce the main topic in a

way that the student can easily grasp. Each important idea is usually illustrated, and commented on. This allows plenty of time to get it written down.

(2) *Condense the Ideas into your Own Words.* If the speaker definitely announces his outline as he goes along, it may be well to use his words. Otherwise it is always a safe practice to use your own. Students who attempt to make a verbatim report of all the speaker says usually defeat the purpose of taking notes. Unless they are skilled in shorthand, their notes will be a meaningless jumble of incomplete sentences; or a selection of complete sentences. In either case they have not *condensed* the ideas but only taken sample sentences. The way to condense is to wait until you are certain you have grasped the idea, then while the speaker is elaborating it, write it down in one or more compact sentences. Of course, this is easier said than done. All of which further illustrates the point that note-taking is an art which can be acquired only by practice.

(3) *How to Detect the Leading Ideas.* In case the speaker does not announce an outline, but "rambles on," it is often difficult to pick out the main thought. (Of course, there is always the

possibility of a "thoughtless" lecture.) Sometimes voice signals will reveal the important points. The speaker is more deliberate when he comes to his main topic headings; or he may accent the more important sentences by raising or lowering the voice. At best, such voice signals are only hints and should not always be taken as pointers to genuine ideas. Sometimes the leading idea is stated as a formal proposition at the beginning of a topic and then illustrated and elaborated; or the facts may be presented first and the main idea stated as a conclusion.

(4) *Devise Your Own System of Abbreviations.* There are two types of abbreviations; first abbreviated sentences and second, abbreviated words. Sentences may be abbreviated by omitting unimportant words. Care should be exercised in this because you are liable to omit significant words. In sending a telegram it is important to express the maximum meaning in the minimum words. Thus a carefully worded telegram of ten words may convey all the meaning that is commonly expressed in ten times as many words. The note-takers language should be "telegraphic."

As to abbreviations of words the student should devise his own system and stick to it. In his very

valuable little book on "Note-Taking" Mr. S. S. Seward suggests five types of abbreviations.

I. Standard abbreviations: *ex.*, for *example; ave.*, for *avenue; N. Y.*, for *New York;* etc.

II. Special abbreviations for special subjects: *psy.*, for *psychology; hist.*, for *history; econ.*, for *economics;* etc.

III. Simplified spelling: *tho, thru, fixt, thoro, foto, etc.*

IV. Common words (phonetic, as far as possible): *are, r is, z that, tt which, wh be, b not, n the, e with, w. from, fr . of, v. this, th*

V. Signs: &, for *and;* ∴, *therefore;* %, *per cent.;* =, *equals;* etc.

Mr. Seward suggests three *Don'ts* for the student who wishes to use abbreviations. "(1) Don't abbreviate by leaving out letters in the middle of a word; as, *alst* for *almost, hlth* for *health, prly* for *poorly*. . . . (2) Don't use one abbreviation for more than one word; as *cl* for *cell* and *clearly*. . . . (3) Don't use ingenious forms that call up other associations: as, 2 for *to*, ? for *question*."

C. How to Gather Facts from Observations and Experiments

Nearly all courses in the sciences require the student to gather a certain amount of information from first hand observation and experiment. Just how to make accurate and precise observations and record them; just how to perform a successful experiment is a very difficult task. Indeed, one of the primary purposes of most elementary science courses in college is to teach you how to do this very thing. It is clearly beyond the scope of this book to discuss the scientific method. We shall confine ourselves to a few practical suggestions concerning how to record and preserve the facts. These may be summarized as follows:

(1) *Find out from your instructor his rules* regarding note-books and how notes should be kept. The freshman will soon discover that nearly every teacher of science has his own private notions about note-books. Some require that all notes be written up in ink, others will accept rough pencil notes. Some require very exact drawings of apparatus, specimen, and other objects of observation; others will accept rough drawings that are approximately correct.

Teachers also differ in their opinions concerning what a note-book should contain. Some want only the *results* of your experiments and observations; others require a statement of method and technique.

(2) *Find out, as soon as possible, your instructor's method of teaching.* Freshmen often fail in science course because they never get a correct idea of what the teacher wants them to do. There are many different methods of teaching science. The "observational sciences" (botany, zoology, and geology) are taught by two different methods. One method requires that the student find out everything for himself. He is placed in the laboratory and given a plant, animal, rock, or some part of one and told to find out all he can about it. The other method gives him a set of instructions to follow and his laboratory work consists in carrying these out. The most common thing is a combination of these two extremes. This shows why we cannot put down a set of rules on how to do laboratory work. About the only rule we can give is: Find out the instructor's system of teaching and fall in line with it.

(3) *Develop the Laboratory Attitude.* The word "laboratory" means "workshop." It is a place to labor. Successful laboratory work is not

just performing a "bag of tricks." Of course, it is important that you learn the tricks, but this is not all there is to it. The laboratory attitude is that of constant inquiring and questioning; it is the place where you put questions to nature and find out the answers. Laboratory work is a voyage of discovery.

The Organization of Information

(1) *The Purposes of Organization.* Information should be organized for two reasons. First, as an aid to memory and second, as an aid to understanding. As knowledge increases it becomes more complex. Proper use of it demands that it be kept in order. A story is told of a country merchant who was seen throwing invoices, receipts and important papers into a barrel. When asked why he was throwing away his papers he replied "that is my file, I throw them into that barrel so that I will know where they are when I want them." The minds of some students are like that barrel.

(2) *The Technique of Organization — Outlining. a. The Preparation of the Data.* Assuming that your data are in the form of notes the first step is to get them ready. This consists in getting a bird's-eye-view of the material. The scope of

the field must be comprehended. Next, be sure that there are no errors or serious omissions in your notes. One reason for writing up notes is to correct the errors and fill in the gaps. Perhaps a certain amount of "culling" should be done. Irrelevant facts should be eliminated.

b. Select a Basis of Classification. To do this right you must keep clearly in mind your *purpose* for making the outline. Almost any body of data may be classified in several different ways; the manner of classifying is determined partly by the purpose and partly by the nature of the data. The first step in the process is to discover the relations that exist among the ideas or facts to be classified. It is assumed that the ideas contained in your data are related either logically, mechanically, historically or in some other way. You must discover these relations and select the one that best fits your purpose. This will be the basis of your outline.

c. Make a Tentative Outline. Until you become expert in the matter all outlining will be more or less trial and error. Do not expect that your first attempt will be the final form. One difficulty will be to fit in all your data. You will find some stray points left over which do not seem to fit anywhere. If there are too many such loose ideas it

may be well to revise your basis of classification to take care of them.

d. The Choice and Construction of Headings. The main headings should represent the important and leading ideas. They are usually stated in general terms. They should be stated in a uniform and consistent way; they should be brief and put in parallel form; the important elements should be emphasized.

e. The Mechanics of Outlining. Since most courses in Freshman English include outlining and provide adequate drill in it, we shall not consider the mechanical aspects here. But as a sample outline we shall present one of this chapter.

COLLECTING AND ORGANIZING INFORMATION

I. **As a Type of Study.**

A. *College Work Requiring this Type of Study.*

1. Maximum amount required in science and minimum amount required in mathematics.
2. Advanced courses usually require more than elementary courses.

B. *The Advantages of this Type of Study.*

1. It leads to research and gives training in it.
2. It is learning by doing.
3. It promotes the spirit of independence and initiative.

C. *The Technique of this Type of Study — Note-Taking.*

1. The purposes of note-taking.
   a. To record and preserve ideas and facts in a condensed form.
   b. To aid in study.
      (1) To aid comprehension and concentration in reading.
      (2) To aid memory by simplification and condensation.
2. The uses made of notes.
   a. To prepare for recitations and examinations.
   b. To prepare a theme, essay or speech.
   c. To fulfill the requirements of courses.
   d. To use later in life.

II. Collecting Information.

A. *How to Gather Facts from Written Sources.*

1. Know exactly what you want.

2. Know where to begin looking.
   a. In the library catalogue.
   b. In classified indices.
   c. In standard books of reference.
3. Know how to follow up clues.
4. Know how to evaluate material.
5. Know how to take notes on written material.
   a. Make a rapid preliminary survey.
   b. Make a tentative outline.
   c. Re-read the material and revise the outline.
   d. Check up your results.

B. *How to Gather Facts from Oral Presentations.*

1. Do not get in a hurry.
2. Condense the ideas into your own words.
3. Learn to detect the leading thoughts.
4. Devise your own system of abbreviations.

C. *How to Gather Facts from Observations and Experiments.*

1. Follow the instructor's rules for notes and note-books.
2. Conform to the instructor's method of teaching.
3. Develop the laboratory attitude.

III. Organizing Information.

A. *The Purpose of Organization.*

1. As an aid to memory.
2. As an aid to understanding.

B. *The Technique of Organization —Outlining.*

1. Prepare the data.
2. Select a basis of classification.
3. Make a tentative outline.
4. Choose proper headings.
5. Follow a uniform system of nomenclature.

Chapter IX

THE PROBLEM–SOLVING TYPE OF STUDY

Constructive and Assimilative Study. The three types of study with which we have been dealing have to do with securing information. The chief aim of reading, memorizing, and collecting and organizing data is that of "getting" knowledge. However, throughout all three of these types there has been another factor which in reading, was called "comprehension"; in memory it was termed "understanding"; in the last named type it was called "organization." You were told that you must comprehend what you read; understand what you memorize; and organize what you assemble. This should be done in order that the knowledge so acquired might be more permanent. But the comprehension, understanding, and organization of study have another purpose and that is making the knowledge useful. Studying is not only a matter of acquiring and retaining information, it is also a process of applying this information to practical problems. At

first it may appear that if a student has the knowledge, he will naturally apply it when problems arise. This is not true necessarily. You must know how to apply your knowledge, just as you must know how to obtain it.

The practical value of any college course is measured not in terms of the information it offers, but in terms of the use that can be made of it. This is the difference between theory and practice. Theory is valuable and is supplementary to practice. Facts for facts' sake, however, have no value save as mental ornaments; facts for the solution of problems have great value.

The types of study that have to do with securing and retaining information we shall call "assimilative" and those that deal with applications of knowledge to problems we shall call "constructive." These two words are borrowed from Dr. Adams who says: "We find that, broadly speaking, our work is of two kinds. Sometimes our main business seems to be to acquire knowledge: certain matters are placed before us in books or by our teachers, and we are required to master them, to make them a part of our stock of knowledge. At other times we are called upon to use the knowledge we already possess in order to attain some end that is set before us. In

a general way the two may be classed as acquisitive and constructive work. . . . In acquisition, we depend largely upon memory, in constructive work we depend more upon the reason.

"For a very little reflection will make you see that while there is a distinct difference between the two kinds of study-work they must not be regarded as entirely separate from or independent of each other; they are not mutually exclusive; they necessarily impenetrate. Assimilation does not consist entirely in gathering new facts, nor does construction confine itself to the manipulation and application of facts already acquired. The two processes to some extent overlap. In acquiring new facts we must always use a little reason; while in constructive work we cannot always rely upon having all the necessary matter ready to hand; we have frequently to stop our constructive work for a little in order to acquire some new facts that we find to be necessary. Thus we acquire a certain number of new facts while we are reasoning about things; and while we are engaged in acquiring new matter we must use our reason at least to some small extent."

Courses that Require Constructive Study. All courses require constructive study to a greater or less degree. Some courses like mathematics and logic

are largely problem-solving courses and represent one extreme. Science courses to a considerable degree are of the constructive type because there we are continually making assumptions and verifying or rejecting them by observation or experiment. Foreign language work in a sense can be regarded as a form of constructive type of study. In fact Dr. Adams goes on to say: "One of the best examples of the working of constructive study is to be found in the translation into English of passages from a foreign language. This always presupposes a great deal of acquired knowledge and skill and exemplifies their application to a specific problem. . . . Each new passage is necessarily a problem, sometimes easy of solution, sometimes, very difficult; occasionally, indeed, with the student's limited knowledge, insoluble." Dr. Adams goes on to show that a passage to translate at sight presents a problem similar to one in mathematics or logic. In mathematics the problem or aim is to find the answer or, at least, an answer that will satisfy. In translation the problem is to find the meaning. "To begin with, you must start with the assumption that the passage has a meaning; quite a definite meaning. Accordingly, if what you make of it does not seem sense, then you may be quite sure that you are wrong. . . . Your first prin-

ciple, then, must be to make meaning out of what is presented to you. When you have a choice of meanings, you must see to it that you take into account the whole passage."

While it is true that mathematics and logic are the two problem-solving subjects it can be shown that all language translations, all scientific testing of theories, all construction of historic data, are more or less of the problem-solving type of work.

How Problems Arise. Your problems as a student will come from two sources. First those set by your instructors; and second those that arise out of your environment. It is with the first sort that we are to deal. However, the principles discussed will hold good for the solution of any kind of problems. A problem has been defined as "an obstacle in the path of thought." A problem always involves an obstacle to overcome, a difficulty to be dealt with, a puzzle to be solved, a perplexity to work off, a doubt or uncertainty to be cleared away. Problems in mathematics are all of these and more. In other subjects problems arise in different ways. But the essential thing about a problem is that you are always "up against something difficult" or to use another metaphor, "you are in the hole trying to get out."

Ways of Attacking Problems. What is the

thing to do when you are faced with a difficult problem in mathematics, or an obscure passage of foreign language, or when you are in trouble and "up against an obstacle"? There are a variety of things possible. Your first impulse is to follow some instinctive prompting and go at your problem blindly in a hit or miss fashion. This trial and error method of problem-solving is typical of animals. When a hungry cat is placed in a box with food outside, she immediately tries all kinds of ways out; if one fails she tries another and so on until by chance she strikes a successful method. This is a common practice among students especially when confronted with problems that permit the trial and error procedure. Watch yourself work at a difficult problem in geometry and see how many figures you draw before you hit on the right one. Of course, you are guided here by past experience to a certain extent, but your method is essentially trial and error.

Another method of attack upon your problems is to go at them in the same way you solved some similar problem in the past. If the problem is new and there is nothing in your past experience that exactly matches it, you will seek something that resembles it. This method does not always bring the solution but it often yields helpful suggestions.

Still another way is to call for help. This is not solving your problem at all but asking others to do it for you. The student who forms the habit of relying on his friends or his teacher to do all his difficult thinking may never hope to obtain an education. For after all, the purpose of setting problems is to train you to handle the practical difficulties of life.

How Great Minds Solve Problems. We can learn much about how to deal with our problems by inquiring how the master problem-solvers work. A careful study of the lives of the great men who have solved some of nature's most perplexing problems reveals certain outstanding mental traits.

In the first place they were all *shrewd guessers*. Huxley said that the astronomer "Kepler was the wildest of guessers." Thomas Edison is well known for his ability as a good guesser. He is reported to have guessed some thousand times before he finally hit on the right solution of the problem of the incandescent light. This is certainly an interesting insight into the mind of the genius. How many times have we been told in school not to guess, and yet we find that the greatest minds of the world have been the boldest and wildest guessers.

They were also good at eliminating the wrong

guesses. This is the mark of the true genius. Anybody can guess, but it takes a great mind to devise means of checking the guesses. When Huxley said that Kepler was the " wildest of guessers " he meant that Kepler had a mind rich in suggestions for the solution of nature's problems. A biographer of Kepler says: " We may notice as another peculiarity of Kepler's reasonings the length and laboriousness of the processes by which he discovered the errors of his first guesses. One of the most important talents requisite for a discoverer is the ingenuity and skill which devises means for rapidly testing false suppositions as they offer themselves."

A third characteristic of great thinkers is that of suspended judgment. They were usually willing to abandon any hypothesis or guess that proved to be inaccurate or untrue. So ingrained had this habit become in Newton that he gave up as false what afterwards turned out to be true. We refer to his universal law of gravitation which is that bodies attract each other directly as their mass and inversely as the square of the distance between them. When he tried this theory out on the relation between the earth and the moon it didn't seem to square with the facts of astronomy. So he gave it up as unproved. Later he found that he had been using in his calculations

an erroneous measure of the radius of the earth. When the earth's true radius was found he made his calculations again and found that his law was verified.

Fourth, great problem-solvers show a remarkable keenness of perception. In nearly every problem situation, there is some fact, usually a subtle relation, which if observed will lead to the conclusion. It is said that Galileo while in a cathedral noticed that a complete oscillation of a swinging chandelier always took the same time regardless of the length of the stroke. On the basis of this simple observation he invented the pendulum which is the underlying principle of all our time-pieces.

Steps in the Problem-Solving Process. In a valuable little book entitled "How We Think" the philosopher John Dewey has set forth the steps in the problem process. It is useless for us to attempt to improve on this so we shall restate it as briefly as possible. Take as a sample his illustration from the ferry-boat.

"Projecting horizontally from the upper deck of the ferry-boat on which I daily cross the river, is a long white pole, bearing a gilded ball at its tip. It suggested a flag pole when I first saw it; its color, shape, and gilded ball agreed with this idea, and

these reasons seemed to justify me in this belief. But soon difficulties presented themselves. The pole was nearly horizontal, an unusual position for a flag pole; in the next place, there was no pulley, ring or cord by which to attach a flag; finally, there were elsewhere two vertical staffs from which flags were occasionally flown. It seemed probable that the pole was not there for flag-flying.

"Then I tried to imagine all possible purposes of such a pole, and to consider for which of these it was best suited; (a) Possibly it was an ornament. But as all ferry-boats and even the tugboats carried like poles, this hypothesis was rejected. (b) Possibly it was the terminal of a wireless telegraph. But the same consideration made this impossible. Besides, the more natural place for such a terminal would be the highest part of the boat, on top of the pilot house. (c) Its purpose might be to point out the direction in which the boat is moving. In support of this conclusion, I discovered that the pole was lower than the pilot house, so that the steersman could easily see it. Moreover, the tip was enough higher than the base, so that, from the pilot's position, it must appear to project far out in front of the boat. Moreover, the pilot being near the front of the boat, he would need some such guide as to its direction. . . .

I formed the conclusion that the pole was set up for the purpose of showing the pilot the direction in which the boat pointed, to enable him to steer correctly." (Dewey, "How We Think," pp. 69–70.)

Dewey goes on to point out that in the problem-solving process there are four steps all of which are illustrated by the above example.

(1) *The Problem must be Understood and Kept Clearly in Mind.* In the above case, the problem was that of finding out the purpose of the pole; and all the way through the process this question stood out as the controlling fact. All ideas that came to the mind were accepted or rejected on the basis of their relevancy to this question. In this particular illustration the difficulty was easily located which is not always the case. Sometimes it is hard to define the problem or to understand what it is that you are up against, or what kind of a hole you are in. The old saying that a problem clearly understood is half solved contains more than a grain of truth. This fact is often brought out when students fail to answer a question correctly because they do not grasp the full meaning of it.

(2) *Seek Suggestions for a Solution.* Our man on the ferry-boat had before him four suggested solutions: that it was a flag pole, ornament, wireless

terminal, guide for steering. Had he been still more ingenious perhaps other suggestions would have occurred. Now the point here is that the greater the number of such suggestions the greater your chances of getting the correct one, or the one that will lead to the solution. This is what we mean by fertility of mind which characterizes the genius. However, it is little help or comfort to you to tell you that geniuses have minds rich in suggested solutions to their problems. What you wish to know is whence come these suggestions. What are the sources of all these clever ideas? Certainly it must be past experience. Since flag poles were the most familiar kind of poles they naturally were suggested first. If the man had never seen nor heard of wireless, this suggestion would have never occurred. In commenting upon this step in the process Professor S. C. Parker says: "This fertility depends upon two things; first, knowledge of related ideas, and, second, the ease and fullness with which these ideas are recalled when needed. In this connection we find striking differences between individuals when confronted with a problem in connection with which they should recall and use their knowledge. Various combinations of the two factors occur, such as (a) little knowledge and meager recall, (b) vast knowl-

edge but meager recall, (c) little knowledge but rather full recall, (d) vast knowledge and fairly full recall. It is evident that the last combination is most favorable for fertile suggestion." Surely your suggestions must come from your memory of similar problems. There are, however, certain aids which the memory may be stimulated by. One is careful analysis of the situation. When the problem is analyzed into its elements, each element may contain a suggestion. For instance, the correct suggestion in the case of the ferry-boat pole was brought about by an analysis of the situation. When the man noticed that the pole was in front of and below the pilot the right suggestion offered itself. Another helpful device is to recall rules and principles that will apply to the case in hand. This is true in the solution of problems of mathematics. A problem in geometry or algebra is more than half solved when you discover the principle on which it is based.

(3) *Carefully Test Each Suggestion.* To refer once more to our friend on the ferry-boat, if he had not tested out each suggestion he might have been satisfied with the first one and gone on believing that it was a flag pole. As each succeeding suggestion arose it was subjected to criticism. The important thing is that the state of doubt or uncertainty per-

sisted until a satisfying solution was presented. This suggests that one danger in problem solving is that of being too easily and quickly satisfied. A common cause of failure in mathematics is the tendency to be satisfied with inaccurate answers to problems.

In speaking of this very thing Dewey says: "The easiest way is to accept any suggestion that seems plausible and thereby bring to an end the condition of mental uneasiness. Reflective thinking is always more or less troublesome, because it involves overcoming the inertia that inclines one to accept suggestions at their face value; it involves willingness to endure a condition of mental unrest. . . . The most important factor in training of good mental habits consists in acquiring the attitude of suspended conclusion and in mastering the various methods of searching for new materials to corroborate or to refute the first suggestions that occur. To maintain the state of doubt and to carry on systematic and protracted inquiry — these are the essentials of thinking."

(4) *Verify Your Conclusions.* How do you know when you have reached the correct solution to your problem? How did the man on the ferry-boat know that the poles were really for the purpose of steering? If he had carried his reasoning processes

further, might he not have found evidence against this? The methods by which conclusions are tested are known as the rules of logic. Logic is the science of thinking and one important aspect of it is to teach you how conclusions may be tested. In mathematics is it always possible to "prove" your answer; in science you cannot really prove but you can verify by further observation and by experiment. This is one purpose of a laboratory; it is a place where these hypotheses and guesses about facts in nature are tested under controlled conditions. The process of proof or verification depends on the nature of the problem. In the case of the ferry-boat satisfactory proof would have been to get the theory checked by the captain or pilot or someone who knew. The real logician would have proved it by employing the syllogism:

"All ferry-boats have pilot poles,

This is a ferry-boat,

Therefore, this boat must have pilot poles."

But the trouble was that the reasoner didn't know that all ferry-boats have pilot poles. One of the requirements of thinking is the discovery of the premises. But we are not concerned here with teaching you the various methods of proof; our only interest is to get into the habit of insisting on some definite verification before accepting as true any con-

clusion. Indeed, a safe proposition to follow in nearly every case is that the "proof of the pudding is the eating." The final test of a conclusion is the way it works out in practice.

Classification of Students' Problems. In a sense everything requiring thought is a problem. It is very helpful to regard everything in life as a kind of problem and attack it as you would a problem. The college student has a peculiar set of problems to handle. These may be grouped under two main heads:

First, study problems, and, second, problems of everyday life. Every exercise, assignment, or lesson is a problem. There are certain subjects in which problem-solving is the main requirement. Problems of everyday life include problems of health, of recreation, of making a living, of getting along in a social way and so on. All of these may be handled by applying the four principles discussed above. The study problems, both those set by the instructors and those discovered by yourself, require some further treatment.

Problems of Language Study. Studying foreign languages involves the solution of many problems. One might suppose offhand, that it is largely a matter of memory. True enough, memory plays a

leading rôle as it does everywhere thinking is required. We have already called attention to the fact that translation is itself a sort of problem-solving in which the problem is to find the correct meaning. Here the process seems to be that of trying out suggested meanings. If the first meaning suggested does not fit either into the context or the construction you should keep on trying until you find a meaning that will fit. The dangers and pitfalls here are about the same as in all thinking, namely that you will be satisfied with an incorrect or a partially correct meaning, or lack the necessary information to furnish you with plenty of suggestions, or fail to verify your conclusion.

Problems in Mathematics. Mathematics is by all odds the subject requiring most problem-solving; and for this reason students find it difficult. There is no way in which mathematics can be made easy other than by learning how to solve problems. It is quite impossible for us to tell you in a brief space how to handle your mathematical problems if you have any. All we can hope to do is to cite some rules which may be followed with profit. These are essentially the same as the four steps in problem-solving already outlined. The chief requisites for success in mathematics are (1) A secure

foundation in what you have covered. Mathematical textbooks and courses are arranged in an orderly sequence; you must know the first steps before you can proceed. For example, a student was failing college algebra and when the case was diagnosed it was found that she had never learned her addition and multiplication combinations in arithmetic. When she went back and learned her fourth grade arithmetic she was able to pass college algebra. (2) The ability to analyze a problem into its elements and note all peculiar relations. This will invariably give a clue to the solution. (3) The ability to recognize a correct answer, or prove it without reference to a set of answers or verification from a teacher. One very important trick in mathematics is that of predicting the answer in general. If your results are "away off" you may recognize at once that you have made a mistake.

Problem-Solving in Science. Science has been defined as the method of putting questions to nature and finding answers. Sandwick gives a good illustration of problem-solving in science. The problem for solution is: "What causes the dew?" There are two ways of going at this problem; one is to start guessing and check the guesses and the other is to observe first the conditions under which dew is pres-

ent and work from these observations. Accordingly we note the following: (1) No dew on cloudy nights, (2) no dew on windy nights, (3) dew after still clear nights, (4) plenty of dew during dry weather, (5)more dew in valleys than on hilltops, (6) more dew on metals than on wood, (7) more dew on cool nights than on hot nights.

With these facts in hand we may begin to guess. First guess: Dew falls from the sky like a very fine mist. But mist comes from clouds and this does not square with facts (1) and (3). Moreover further observation reveals dew under boards. Guess again. Well, it sweats out of the ground like water from a cold pipe. How then does it get on the tops of houses? Why is it prevalent in dry weather when the ground is very dry? So this will not do. After a few more wild guesses which are rejected for one reason or another we finally come upon this theory: Dew is condensation of the moisture in the air caused by contact with cooler surfaces. This sounds scientific, to say the least; suppose we try it out. There is no dew on cloudy nights because the clouds act as a blanket to keep the earth's surface from cooling faster than the air; no dew on windy nights because the wind evaporates the moisture. The rest of the

facts are tested and it is found to square with all of them. So far, so good. Now we will take the final step and devise experiments to prove this theory. Fill a pitcher having a polished surface with warm water. Now cool it rapidly by adding bits of ice. Notice that it soon begins to sweat, that is, the air deposits moisture on its surface. If this is not convincing keep on experimenting and observing until you are convinced.

Problem-Solving in the Social Sciences. Economics is a subject rich in unsolved problems. The problems here are of a more practical nature and require a somewhat modified form of procedure. In the first place it is difficult to observe all the facts and still more difficult to test conclusions satisfactorily. So we have to be content with more theories than in the natural sciences. As a good specimen take the problem of the cost of living. Why has the cost of living increased so in the last few years? The shallow mind answers glibly at once that it was caused by the war. This is true in a sense but the real economist wants to know more than this. He digs down to the bottom of things and tries to find out the elements in the process in increasing costs and the reasons for them. Here again the process is that of

defining the problem, guessing at solutions and testing them as best we can.

Training in Problem-Solving. The college student has a wonderful opportunity to practice in this field. Hardly a day or hour goes by that does not present some problem. When analyzed, training along this line involves several things, among which are the following:

1. *Increase your general fund of knowledge.* We sometimes hear it said that students go to college not to be crammed full of information but to learn how to think. This statement reveals a complete ignorance of what thinking is. Nobody can think in a vacuum. You must have knowledge before you can solve problems.

2. *Cultivate independence.* Do not form the habit of relying upon others to do your mental work. One reason why pupils do not think is that they can get it done more cheaply. Why should you bother to solve your problems when you can hire it done? This attitude gets you nothing but trouble. You may hire them solved in college, but what are you going to do when you get out?

3. *Don't be afraid to guess.* But guess intelligently and do not substitute guessing for thinking.

Guess, but go further and check the guess up. Do not confuse guessing with bluffing.

4. *Be always open-minded and free as possible from prejudices.* Be willing to give up any cherished belief when it has been proved to be untrue. Always seek the truth.

Chapter X

THE DRILL TYPE OF STUDY

All Learning is Habit Formation. It almost goes without saying that such things as learning to swim or skate or run a typewriter or do any skilled act is a matter of habit. All motor learning is an elaborate system of habits. That mental activities are habits is not so clear. It can be shown, however, that there is no essential difference in process between learning to multiply and learning to write. Each depends on certain nervous structure and functions. The process of habit formation and the process of learning are almost identical. President Angell of Yale University says of habits: "The whole course of mental development could truly enough be described as made up of this process of acquiring habits, which once embedded in the tissues of the nervous system become the permanent possession of the individual, ready, when need arises, to step in and deal with the necessities of any particular situation. Without habits, consciousness could never get beyond the borders of the inevitable daily routine. With

habit, however, it is able to pass from victory to victory, leaving behind in captivity the special coordinations it needs."

Habit Formation as a Type of Study. It is true that all learning is habit formation but some sorts of learning are more so than others. Making a thing habitual is so fixing it in the mind or nervous system that it will not be forgotten and can always be done with a minimum of effort. It is, in short, making the act automatic. The only reason for discussing habit formation as a type of learning and saying at the same time that all learning is habit formation is that the process of all learning and the process of all habit formation is the same, but learning may be carried to different degrees of perfection. When an act or fact is learned so completely as to become a part of your permanent mental equipment it then takes on the form of a habit. Habits are fixed and deep seated. It is evident that in nearly all college courses there are certain things that must be made permanent. In language, for example, the most common words in the vocabulary, the ordinary constructions and so forth, must be made mental habits. Various points of grammar must be so completely established in your mind that when they occur there will be no hesi-

tation or wavering concerning them, but you will pass them by with complete confidence and mastery. Likewise in mathematics there are many, many things that must become mental habits. It is obvious that a complete set of mental habits pertaining to the fundamental arithmetical operations is essential. By this is meant "knowing" the multiplication table, knowing the most common addition and subtraction combinations so that they come easily without your having to stop and count on your fingers. Moreover, in order to make higher mathematics easy it is necessary to make habits of many formulae, propositions, theorems, etc., as you go along. A bare understanding of these things is not enough. It is possible to understand completely all the fine points of tennis and not be able to play it at all. Likewise it is possible to comprehend the fine points of a mathematical course and not be able to do the problems.

Kinds of College Work Requiring Skill. In order to learn the multiplication table it was necessary for you to go over it until it was learned. In the same way before you are a good athlete it is essential that you practice. This is true for the accomplishment of any skilled motor performance and most skilled mental performances. Fully to make a habit of some mathematical principle like factoring it is al-

most inevitable that you must do at least ten or twenty or thirty problems before the mental habit is established. Drill on vocabulary in foreign language; drill on the correction of errors you now make in English that are all of the same nature. Learning to speak or write the English language correctly is certainly a matter of drill. In college, then, the major portion of your drill work will be in English and the foreign languages and in mathematics. There will be little of it in the natural and social sciences. But there will be enough to include it in this course.

The Value of Habits in General. Habit formation deserves a place in this course not alone as a type of study but because it is essential that all students form the right kind of habits early in college. We are not thinking of habits now as fixed knowledge of the multiplication table, or language vocabulary or construction but rather as fixed modes of doing, thinking, and feeling.

Habits Formed in College. In college the habits most likely to be formed or modified are three kinds. (1) *Personal habits.* This includes habits of dress, mannerisms, speech, etc. These all undergo radical changes in college. (2) *Mental habits.* Under this head can be put all those habits spoken of before,

such as language vocabulary, mathematical axioms, etc. In addition to such habits we have also habits of accuracy, speed, careful work, open-mindedness, industry or laziness, originality, endurance, strength, flexibility, and so on. (3) *Study Habits.* Every student is bound either to drift into or be guided into modes of study. The aim of this chapter is to guide you into the best habits of study. For once your study habits are formed it is impossible for you to change quickly. By study habits are meant habits of time, place, position, duration, of study. Also are included habits of concentration, outlining, summarizing, reviewing, skipping, or whatever method is followed consistently. College is a place where a great variety of habits is formed. Some of them are good, some are bad; some are for weal and some are for woe. Whether they are good or bad, the same laws hold good for their formation.

How Skill is Acquired. Skill in mental performance and skill in motor acts are acquired according to the same laws. The principles by which we learn to be expert typists or swimmers also hold to make us lightning calculators. Some of these principles will now be stated.

(1) *Practice.* Practice is the fundamental principle of habit formation. The expert in any field

will tell you that his skill is the result of long hours of practice. Likewise the person who knows the meaning of a thousand German words and can give the meaning instantly will tell you that this accomplishment is due to exercise. Practice is a basic law but there are limitations.

In the first place practice will not necessarily make perfect. It may also make "imperfect." If you practice doing the wrong thing you will be expert at making errors. For example. If you always say "he don't" even though you know better, you will never learn to say "he doesn't." This simply means that practice makes perfect the thing that is practiced — not something else. It is sometimes assumed that a person who can read well aloud can also read well silently. Not necessarily. Reading silently is somewhat different from reading aloud. Practice in one may help the other to a limited degree but will not make it perfect. This is the very reason why many college students cannot read, they need more practice.

Furthermore, practicing a given act may not even make that easier. The story is told of a school teacher who became impatient with a boy for saying "I have went." She compelled him to write on the blackboard one hundred times the phrase "I have

gone" in order to give him the necessary practice. After faithfully completing the task the boy handed this note to the teacher: "I have wrote it a 100 times and have went to my seat." Now the trouble was that the boy got the wrong kind of practice.

Cases do occur when practice tends to make us less expert rather than more so. Consider the case of breaking a bad habit. They tell us that the best way to get rid of a bad habit is to let it result in pain or displeasure. Here we go through with it just the same but the end result is not pleasant. This pain in the end tends to more than offset the effects of practice. It does not need to be pain even, it may be any annoying state of affairs.

So it would appear that there is something more to acquiring skill than going through the motions. Two limitations have already come to light. The first is that drill must be on the specific thing that is to be acquired and in the way in which it is to be used; and second that practice increases efficiency only when it results in pleasurable states.

(2) *Drill All Performances in the Way They Are to be Used.* As an example of this take the dictionary-habit formed in connection with the study of language. Teachers will say "learn to use the dictionary, get into the dictionary-habit." Well and

good, but the dictionary-habit makes you expert at handling the dictionary, not the language. Suppose you want to learn a German vocabulary. One way is to begin translating and looking up every word the meaning of which you do not know. This is an "approved method." But what happens is this. You will look at the word long enough to get a meaning that fits the particular context and pass on, making no effort to fix the meaning and other meanings permanently in mind. In other words, you learn to do that sort of thing, but you learn little vocabulary. The way to learn vocabulary is to take a list of words and learn all their meanings; drill on the list until you know it. A Harvard professor experimented on this by providing the students a parallel list of French words and their English equivalents. In commenting on his results he says:

"Subject 1, for example, learned fifty French words daily for twenty-one days. . . . As a result of the practice over one thousand new words were learned, at least for the time being, in less than six and one half hours. The ordinary vocabulary, with the exception of paradigms and declensions, usually learned in a semester's work in university classes is, I am told, less than half this."

(3) *The Practice or the Results of it Must be*

Satisfying. If you thoroughly hate doing a thing and do it only because you feel that you have to, you will make slow progress, if any at all. In the first place the practice itself may be pleasant or unpleasant; or the results may be pleasant or unpleasant. If the mere acts of going through with it are pleasant, practice will be effective even though the results are unpleasant. The converse is also true; the act itself may be annoying and still skill is acquired because there are satisfactions at the end. There is another possibility here; the fact that that you are improving may be satisfying. So we have three corollaries:

(a) *Take an Interest in the Practice for Its Own Sake.* Do it because you like it. You may become an expert calculator simply because you enjoy figuring; or better still you may become a good musician for the same reason, and so on. It is also true that the more you drill on a performance the better you will like it because it gets easier all the time. Of course, you finally reach a point where it grows tiresome. The drill type of study is unpopular for this very reason.

(b) *Interest in the End Result.* This is the thing that keeps us drilling even when it is a burden to go on. We think of what we shall gain if we "carry on" and what we shall lose if we quit. Indeed, this

is the master motive back of nearly all study. Most students stick at dry and weary lessons because of what they hope to get in the end. The tangible rewards of study are "grades" and "degrees." Practice makes perfect when these rewards are in sight.

(c) *Interest in Improvement.* "Watch us grow" is a common slogan for clubs and classes. "Watch me improve" is a similar incentive for any individual undertaking. The more apparent the improvement, the greater the desire for further improvement. Practice in mental functions in which results are obvious is always more satisfying than in those where improvement is vague and uncertain. For example, writing themes is sometimes a distasteful performance because the resulting improvements in your English style are not always obvious. The "daily theme" is a drill type of study in which the satisfying effects must come either from the end-result or from the joy of doing it.

(4) *The Length of the Practice Period.* One very definite limitation to the drill type of study is the length of time you can practice a performance with profit. If during a semester you have to learn the meanings of a thousand French words, a thousand German words, and a thousand Latin words;

also if you have to drill on your English style until it is passable; and if you have other things to practice, what is the best way of distributing your time? As an example of how to find the most economical use of time a professor experimented with 26 students who were learning to write German script. They were divided into four squads. The first squad practiced twice a day for twenty minutes at a time; the second squad practiced once a day for twenty minutes; the third squad practiced once every other day for twenty minutes; and the fourth squad every third day. The results were that the squad practicing one period a day won the contest. Other experiments with different kinds of work seem to bear out the general proposition that one short practice period every day gives the best returns for time invested. The practical application of this to college work in general, especially of the drill type, is that you should practice your vocabulary, and write your theme every day. When your classes recite every other day, there is a tendency to study every other day. This is natural and is not bad. But the best results will be obtained if you use the intervening day for review. Suppose your Latin class recites Monday, Wednesday and Friday at eleven o'clock and you study for this recitation on each of

these days at 10 o'clock, you should set aside an hour on Tuesday, Thursday and Saturday for reviewing the lesson of the previous day. This scheme has been tried and the results are surprisingly good.

Study Habits. Up to this point we have been considering the types of drill that belong to your classroom and curricular activities. This seems to be a good place to get in a word about extra-curricular habits. Studying itself is a skilled performance. How to Study in College means in the last analysis the formation of the right study habits. It is entirely possible for you to know all the rules and principles of How to Study and still be a very poor student. Indeed, the greatest danger you now face is that of going on in your old ways without making any effort to put these study principles into actual practice. The reason is that it is hard to break away from your old tricks and learn new ones. You will be strongly tempted to say to yourself: "Yes, all these things about How to Study in College are well and good, but I managed to get through High School with my methods and I guess I'll try them in College." No doubt some of your study habits are sound, but are they all? Suppose you check up and see what revision you should make in your methods of study.

The Value of the Right Study Habits

(1) *They Increase Speed of Work.* Anything done habitually is done faster. This is because all factors that slow up the process have dropped out. The first attempt at any skilled act or any mental task requires more time than later attempts. Practice has the effect of reducing the time not so much by increasing the speed of the activity which earlier took more time, but by eliminating the useless movements and unnecessary factors.

(2) *They Increase Accuracy.* The more mechanical and automatic an act becomes the more accurate it is. A printing press never makes a mistake provided no errors occur in the type. The camera always photographs the things before it. Acts that are automatic and mechanical are accurate to the extent that they are always the same. Habit admits of little variation. Thus all things that need to be done the same way each time without a hair's breadth of variation, it is best to reduce to habits.

(3) *They Reduce Fatigue.* A new job is more tiring than an old one. Any new task requires more effort than a familiar one. One reason for this is that the beginner makes up in brawn what he lacks in skill. For example, a beginner will pound the keys

off the typewriter, whereas the skilled typist will glide along without exerting much pressure on them. In this connection an eminent psychologist wrote: "If an act became no easier after being done several times, if the careful direction of consciousness were necessary to its accomplishment on each occasion, it is evident that the whole activity of a life might be confined to one or two deeds — that no progress could take place in development. A man might be occupied all day in dressing and undressing himself; the attitude of his hands or the fastening of a button would be as difficult to him on each occasion as to the child on its first trial; and he would, furthermore, be completely exhausted by his exertions."

(4) *They Enable You to do Many Things at Once.* In order to get along at all in the world, it is necessary to carry on many lines of activity at one time. Conscious attention can be on but one thing. The thing that makes the other things possible is habit. Robert Houdin, the great stage performer, took advantage of this simple law of habit as do all similar artists. Of Houdin it has been said: "Houdin early practiced the art of juggling with balls in the air; and having after a month's practice, become thorough master of the art of keeping *four* balls up at once, he placed a book before him, and, while the

balls were in the air, accustomed himself to read without hesitation." It is nothing unusual to see a person play the piano and carry on a conversation at the same time. James, the psychologist, says: "The more of the details of our daily life we can hand over to the effortless custodian of automatism, the more our higher powers of mind will be set free for their own proper work." The more of the details of study you can hand over to habit the more your mental powers will be free to do your lessons. Thus every small act in connection with study should be made so habitual that it will go off like clockwork when the study hour arrives.

(5) *They Stabilize Activities.* "Habit is the enormous fly-wheel of society" says James, "its most precious conservative agent. . . . It alone prevents the hardest and most repulsive walks of life from being deserted by those brought up to tread therein. It keeps the fisherman and the deck-hand at sea through the winter; it holds the miner in his darkness, and nails the countryman to his log cabin and his lonely farm through all the months of snow; it protects us from invasion by the natives of the desert and of the frozen zone. It dooms us all to fight out the battle of life upon the lines of our nurture and our early choice, and to make the best of a pur-

suit that disagrees, because there is no other for which we are fitted, and it is too late to begin again." To paraphrase this a little it might be said: "Habit is the enormous fly-wheel of study and its most stabilizing influence. It alone keeps the student at his books through the long winter evenings and through the beautiful spring days when he would rather tread in paths more pleasant; it drives us all to intellectual hardships and drudgery which we could not otherwise endure; it dooms us to do all our lessons in the same inefficient or efficient way that we have always done them; it settles our modes of thinking and our ways of judging."

Some Dangers of Wrong Study Habits

(1) *Most Habits are Formed Early in Life.* In the famous chapter on Habit in James' Psychology, from which we have already quoted freely, he goes on to say: "Already at the age of twenty-five years you see the professional mannerisms settling down on the young commercial traveler, on the young doctor, on the young minister, on the young counsellor-at-law. You see little lines of cleavage running through the character, the tricks of thought, the prejudices, the ways of the 'shop' in a word, from

which the man can by-and-by no more escape than his coat sleeve can suddenly fall into a new set of folds. On the whole it is best that he should not escape. It is well for the world that in most of us, by the age of thirty, the character has set like plaster, and will never soften again."

(2) *Habit is Non-Progressive.* There is a natural tendency for us all to do things in the "good old-fashioned way." Customs and traditions are followed with ease. Seeking the line of least resistance we do things in the habitual way. There is no progress to be made until someone breaks away from habit and custom. In the case of studying it is all too easy to do it in the way you have always done it. Habit always fixes hard and fast the thing of the past, it never brings anything new into existence. To quote James again, he says: "There is an everlasting struggle in every mind between the tendency to keep unchanged, and the tendency to renovate its ideas. Our education is a ceaseless compromise between the conservative and the progressive factors. Hardly any of us can make new heads (ideas) easily when fresh experiences come. Most of us grow more and more enslaved to the stock of conceptions with which we have once become familiar, and less and less

capable of assimilating impressions in any but the old ways. Old-fogyism, in short, is the inevitable terminus to which life sweeps us on."

(3) *Habit is Indiscriminate.* Habit does not distinguish between the good and the bad or the right and the wrong. Whatever is turned over to habit, it takes and establishes. If you practice making an error that error becomes a habit just as soon as the truth would. It would have been just as easy for you to have learned that $2 \times 2 = 5$. It makes no difference to habit whether it is right or wrong, good or bad, all is taken as it comes and fixed. Students should be extremely careful concerning the things entrusted to habit. Only those details of life or of study, which once done correctly, may be reduced to habit. The main ideas should be dealt with by conscious attention.

Some Good Study Habits. All students can afford to cultivate a few fundamental habits which are essential to all studies.

(1) *Carefulness.* Do things right. If a theme is worth writing, it is worth your best effort. The habit of doing things in a half-hearted manner leads to tragic endings. The first tragedy is that of errors. Most errors arise through carelessness.

(2) *Clearness.* Always insist on everything being clear and well understood. Do not accept hazy ideas or foggy notions.

(3) *Cheerfulness.* Grouchiness and gloom are bad companions for study. It is said that more energy is consumed in a frown than in a smile anyway; for a frown brings into use something like sixty muscles whereas the smile requires the use of about fourteen. The habit of cheerfulness can quickly be acquired by going through the motions.

(4) *Criticism.* In a previous chapter we have spoken of the value of the critical attitude in study. Students should early get into the way of taking "with a grain of salt" much that is handed to them in lecture and textbooks. Not that it should be disbelieved but merely checked up.

(5) *Despatch.* Be on time. Do your work on schedule. Nothing is worse to a student than the bad habit of procrastination. Putting it off until tomorrow encourages putting it off another day; this helps to put it over until the next day; the result is, it is not done at all. Swift in his Psychology and the Day's Work says: "Some people again are always making resolutions — always promising themselves to begin work vigorously, tomorrow, always waiting for a great and perhaps conspicuous opportunity to

do social service, always preparing to break a bad habit; and then, as the habit of postponement becomes fixed, moments of anguish come, followed by periods of elation, as emotional virtue again soothes the mind. These people are rich in purposes, resolutions, and plans, but they never cross the Rubicon and burn the bridges."

(6) *Decision.* Get quickly the habit of making decisions. This is what our authority on habit, Professor James, has to say: "There is no more miserable human being than the one in whom nothing is habitual but indecision, and for whom the lighting of every cigar, the drinking of every cup, the time of rising and going to bed every day, and the beginning of every bit of work, are subjects of express volitional deliberation. Full half the time of such a man goes to the deciding or regretting of matters which ought to be so ingrained in him as practically not to exist for his consciousness at all. If there be such daily duties not yet ingrained in any one of my readers, let him begin this very hour to set the matter right."

(7) *Endurance.* Learn to stick to a task until it is completed. The habit of switching from one subject to another; from one job to another, without ever bringing any one to completion is a damaging

practice. Of course, there is a limit on the time you should wrestle with a difficult problem before giving it up. If the problem cannot be solved then it is best to quit it. Most students, however, quit long before they have determined whether the problem is impossible or not.

(8) *Neatness.* This a habit that will yield good returns. Of two examination papers of almost equal value, most professors will grade higher the one that is neater. Neat written work, neat appearance, a neat desk, all count for a lot in the world.

(9) *Regularity.* Students who do their work with system and regularity, who follow a schedule of work, will accomplish twice as much with one half the expenditure of effort. By physical regularity we attain bodily health; by mental regularity we achieve mental expertness. Regularity makes you reliable and dependable at all times.

Chapter XI

EXAMINATIONS

Examinations — Important Events. Examination time is usually a very serious occasion in the lives of most students. It is a time of eager expectation, a time of worry and work. Some students take examinations more seriously than others. This is largely a matter of temperament. But even the most phlegmatic and carefree approach the examination room with more or less anxiety. Success in an examination depends partly upon the knowledge of the examination procedure and technique. In order to set forth some of the principles of preparation and of execution, this chapter is presented.

Three Classes of Students. In respect to examinations students may be thrown roughly into three classes. In the first class are those who by conscientious daily work and application know their facts and are able to use them. This class constitutes a small percentage of the total. In the second or middle class are all those who have studied an average amount and know some of the facts. But they

are not fully prepared for an examination. They need to review their lessons, organize their material and get it into useful shape. Finally, the third class is made up of those who for various reasons know little or nothing about the subjects for examination. Such persons must employ many and varied devices to get sufficient knowledge in a short time to enable them to pass. The class you are in depends on the degree of your preparation. But whatever your degree of readiness may be, the following principles of preparation should be considered.

The Purpose of Examinations. In the main there are two purposes in giving examinations. First, to test your knowledge; second, to compel you to review your lessons and organize your material.

Examinations as Tests. In most cases examinations are not given to find out how much you know. If the teacher is on his job he will know that already. That is, he will have a general idea of what facts you possess and of your relative class standing. He does not know exactly; and moreover he may not have evidence by means of which to verify or fail to verify his opinion of you. There are, however, certain types of courses, such as lecture courses and correspondence courses, in which the teacher depends solely on tests to find out what you know.

In this connection there are certain aspects of knowledge which must be tested in any case. The two principal points are application and organization. A student may by virtue of a good memory make an excellent showing in daily recitations and in class work but be wholly unable to organize his knowledge or apply it to practical problems. For these reasons, examinations must continue to be what they have always been, a test of knowledge, its organization and application.

Examinations as Educational Measures. The examination is an excellent device to make people study. Students will work in preparation for an examination when they will not work for anything else. There is a certain advantage to be gained from working under pressure. Mental efficiency rises to its peak, interest in the subject is usually aroused. It is a common thing for students to go through a course and not become interested until they begin to prepare for the examination. The examination not only calls for study but efficient study. The time is short when the student begins. He is put to it to find the best method of learning a lot in a little time. But this is cramming and hence not the thing that examinations aim to encourage. The thing that examinations should encourage is organization of facts. In prep-

aration for examination the student is urged to look for relations and meanings in his notes and lessons that he had not previously noticed. Moreover, he is compelled to organize his knowledge into some kind of a system before he can use it on the examination.

Examinations are also a stimulant to the student to seek his weak spots and strengthen them. One part of your education is to know your weaknesses; another part of your education is to correct them. The examination is like a mirror which you hold before you, it reveals you not as you imagine yourself to be, but as you actually are.

The Principles of Preparation. Preparation for examination can be most effective if made in accordance with certain educational principles. The nature of your preparation, however, will depend on whether you are in class one, two or three, of the students mentioned above. The principles here laid down will cover all classes.

1. *Know Your Facts.* Preparation for examination should begin at the beginning of the course. Each lesson should be studied with the idea in the back of your mind that an examination is coming. If you have been wise and prepared yourself bit by bit and day by day, you already know your facts.

But how easy it has been to think, "Oh, well, examination is a long way off: I won't cross that bridge until I get to it." Behold! you are at the bridge and do not know it. Anyway, suppose you do not know your facts. How are you going to get them and get them quickly? The answer is that you must cram. Now cramming is supposed to be a very, very bad thing. Teachers, professors, psychologists and all the rest are unanimous in their condemnation of it. Let us see for ourselves whether cramming is inherently and always and everywhere bad in all forms and shapes, or whether it is ever possible for cramming to be a good thing. Wholesale condemnation or wholesale acceptance of any principle is almost certain to be in a measure wrong. There are always exceptions and loopholes.

Why Cramming is Bad. Cramming is a bad practice because after the examination is over you forget all that you had crammed. The process seems to be that the student beginning a few hours before the examination crams his mind full of facts and figures about the course in question, crowds his memory to the limit, and then disgorges it all when he comes to the examination and that is the end of his knowledge. It means that the knowledge so chucked in your memory has no permanent value.

In the second place it seems to us that cramming is dishonest. This may seem like an exaggerated statement. But let us see. Suppose Mr. A. prepares a "crib" consisting of the facts that he needs to know on the examination. He takes his crib with him and copies from it. This, we will all agree, is dishonest. Now suppose Mr. B. makes a crib but instead of taking the crib to the examination memorizes it. On the examination he copies from his memory. Mr. B sees the facts with his "mind's eye," Mr. A sees them with his natural eye. After the examination is over Mr. A burns his crib; Mr. B. allows his to fade from memory. Who is the worst sinner, Mr. A. or Mr. B? You may answer that A is because B studied more than A, and B will retain more than A. Will he? After a period of three months give A and B the same examination unexpectedly and see if A will do as well as B.

Why is it so easy to forget what we cram? There are at least four reasons.

(*a*) Psychologists have found by experiment that spaced learning is far more permanent than unspaced. If a person has ten hours to learn a subject, the learning is much more permanent if this time is spent in short study periods and distributed over several weeks. The reason for this is that when a

fact is learned or an association is formed time is required for it to settle down or soak in. Learning is forming brain connections. When a new connection is formed it must be given an opportunity to "set" or become established before others are formed to interfere with it. The matter is clear in the case of athletics. Suppose an athlete should try to cram training say in a period of a few hours to make the football team. Or suppose a track man should attempt cramming to get ready for an event. Nerve tissue obeys the same laws as muscular tissue.

(*b*) Material learned for the purpose of being used at a fixed time will be retained until that time and then forgotten. In order to make facts our permanent possessions they should be learned with that end in view. Our memories obey our impulses to a remarkable extent. If you memorize a speech to be said on a certain occasion, you will have no trouble holding it in mind until the occasion arrives and you say it. After that you will find that it slips away with great speed. The reason is that the connections formed are but temporary affairs. It is like building a temporary bridge. The bridge stands until it has served its purpose and is destroyed.

(*c*) Cramming is usually mechanical memorization. Lessons learned by mechanical methods are

never as permanent as those learned by logical methods. The usual device for cramming is visualization. The student prepares a syllabus or outline or scheme of the facts; gets this on paper and fixes a mental picture of it. Now mental images are by their very nature fleeting and unstable. They "are like the chaff which the wind driveth away." Unless the image is exceedingly vivid and the original impression exceedingly intense it will not stand the wear and tear of time. At best, mental pictures are but temporary devices. Another mechanical system of cramming is to prepare a key or a code, and by memorizing this key as a skeleton, one can fit into it the facts to be remembered. This is a little better. But here again when the key or code is forgotten, all facts go with it.

(*d*) The fourth reason why cramming is bad follows from the third — there is no inter-relation or organization of the facts. They are all crowded and jumbled together in the mind. The connections that hold these facts with other facts are all equally insecure. It is like building a house without anchoring it to the foundation. When a fact is lost it cannot be regained because there is nothing to bring it back. It is obvious that if learning is forming connections and associations, the more connections a fact has, the

better chances it has of remaining. If one bond breaks another may hold. But where it is dependent on one link, and that link fails, the fact is gone.

Can Cramming be Made Educational? Going back to our original question we ask whether or not cramming is always and everywhere a bad thing? As far as our first reason stated above goes, it is. Cramming is bound to be unspaced learning. It must be done on short order. There is no way around this. But there is a way around the other three bad features of it. In the first place collecting facts and getting them in your mind just before an examination *need* not be merely for the sake of passing that examination and nothing more. It is conceivable, although highly improbable, that a student in preparing for an examination may be doing it with an eye to making those facts a permanent possession. In the second place, cramming *need* not be done by mechanical means. Logical memory methods may be employed. But here again it is not likely that they will be for the simple reason that they require a longer time. Finally, there is no reason why the crammer should just throw the facts together; it is to his advantage that they be organized and logically arranged.

The whole matter boils down to this: cramming

is bad partly because it must be done in a short time and partly because poor methods of memory are employed. If then, the methods are improved will the facts learned in a short time remain as permanent possessions of the student? They will to a certain extent, but not to as great a degree as they would had the learning of them been distributed over a longer period of time.

2. *Organize and Systematize Your Facts.* This second principle of preparation assumes that the student has his facts, but does not have them in proper shape for us. This means that he does not see the broader relationships and subtle implications of them. Some students succeed in learning a body of material without knowing what it's all about. They are like the farmer who upon entering a city complained that he could not see the town for the houses. In our sophistication we may laugh at the farmer but he was right. What he lacked was perspective. This is what students usually lack. They need to rise above the facts and get a bird's-eye-view of the subject and its relations to other subjects. The worm's-eye-view is dangerous when it comes to examination. Many professors are fond of asking questions that require a perspective of the subject. Often students fail on certain questions because they

fail to recognize the facts called for. They have never viewed the thing from that angle. So when a familiar question is put in a queer way, as is often the case, the student may fail not because of ignorance but because of lack of vision. The moral to all this is: view your facts from all angles, noting especially peculiar relations and implications. Which amounts to saying: Do some real hard thinking on the subject before you appear for examination.

All this calls for effective review. Now, reviewing is an art in itself. It calls for two things. First, it requires that the student bolster up his weak spots. He may think he has certain facts, but when it comes to a show-down they are absent. The review is the place to bring up the straggling facts. It is also the place to patch up the memory. However well you may have mastered a subject, some of it is bound to slip away in time. Reviewing is re-learning. The only sure way of remembering is continually to re-learn or continually make use of the material. The chances are that you do not have occasion to use continually all that you learn about a course, — hence re-learning is your only way out.

In the second place, reviewing that is not just re-reading, requires a systematic outline of the facts. The value of outlining has already been emphasized.

You should have considerable practice in doing it. On the review you should make an outline of your outlines of separate sections or chapters. Let this outline serve as the basis of your work. Facts can be arranged in it so they will be easily remembered.

Third, reviewing means that you will see new relationships and features not previously noticed. The more you know about a subject the more you will learn as you go over it again.

3. *Be Able to Apply What You Know.* There is a certain virtue in knowledge for its own sake but most professors like to test their students' ability to apply what they know. To know a body of facts and to be able to apply them to problems are two different things. Application is a kind of mental manipulation of facts. It is, in short, imagination. Thus in preparing for your examination you should use your imagination freely. An examination in law for example is full of imaginary cases with all sorts of suppositions attached. Students should practice application because this is one way that professors test their knowledge. A practical question will be asked. Before the student can answer he must have the facts. Questions of this sort may not test the students' knowledge of the facts. It does not follow, that since to answer a practical question you must have the

facts, if you do not answer the question you do not have the facts. The point is the student may have the facts and still cannot answer the question because of his inability to apply his knowledge. Thus, the only way to be prepared for this kind of question is to practice applications.

4. *Find Out All You Can about the Nature of the Examination.* We pass now to principles of a more practical nature. It is entirely legitimate and honest to collect all previous examination papers and study the questions. Some teachers frown on this but students continue to do it. It is the opinion of the writer that it is a wise and proper thing to do. A note of warning should be sounded. Don't be misled. Don't assume that the same questions or similar questions will be asked. It is likely that the teacher will change his style of examination completely. Be ready for him. However, it is true that most professors stick to one line of questioning.

If you cannot obtain previous questions, do not hesitate to ask the professor to tell you the *nature* of the examination. If he is just and fair (as most professors are) he will tell you. Some will go so far as to give you sample questions. Any of them will tell you what the examination is to cover and will give you advice on how to prepare for it.

5. *Study Your Teacher.* But do not substitute this for studying your books. Every teacher has his own ideas as to what is essential and what is non-essential. There is usually some special topic or aspect of a subject in which he is most interested. Naturally he thinks this is most important. Now whatever may be your idea of the important points you cannot afford to neglect what the teacher thinks is important. Some teachers are strictly for details; others want the general ideas. Some like long discussions of a topic; others like them short and "snappy." Some like answers in outline form; others want the outlines filled in. And so on and on. A knowledge of all these peculiarities, personal hobbies and idiosyncrasies may stand you in good stead. But do not rely too much on this sort of thing. You may get fooled.

6. *Physical Preparation.* Never go to an examination when you are tired. Physical fatigue means that there is poison in the blood. This is carried to the brain. The brain action is dulled and slowed up. Some students indulge in the foolish practice of all-night sessions with their books prior to an examination. It never pays. It is a well known fact that fatigue deadens memory. On the night before your examination, retire early. Get all the rest you can.

If your examination is scheduled for the afternoon, work up until eleven A.M. and then go for a walk. Moving picture shows furnish excellent pre-examination recreation. Let the three or four hours before an examination be filled with play of some sort.

Avoid drugs and stimulants. Students very often "dope" up before an examination. In general this is vicious practice. A single cup of coffee or tea may be all right. Alcohol or tobacco will cut down your mental efficiency. Never smoke during or just before an examination.

During the examination period keep as physically fit as possible. Take plenty of exercise. Eat moderately. Never eat much before an examination. Keep all your bodily functions in order.

Finally, don't worry. After you have done your best at preparation let your mind be occupied with other things for awhile. Don't brood over the possible outcome. The best way to kill off worry is to find something to do. If nothing appeals to you, go to the movies.

7. *The Finishing Touches.* Sometime before the examination make a list of all the things you are going to need. Here are some of the things to remember. (1) Fill your fountain pen. If you fear that

it will run dry, take along a bottle of ink. Don't depend on obtaining oil from a "wise virgin." (2) Take two sharpened pencils. (3) One eraser. (4) Two blotters. (5) Plenty of scratch paper. If the examination requires drawing instruments or other paraphernalia, go armed.

How to Work on the Examination. The mental attitude of the student who approaches the examination is very important. Most students go to the examination like a criminal to his execution. There is always a measure of emotional excitement which varies in different persons. Some approach the examination room with a great calm and serenity; others with exceeding fear and great trepidation. Where this intense emotional excitement exists, it often paralyzes mental activity. Fortunately it usually wears off in the course of time. There is no formula by which this can be cured or overcome. It is caused often by an over-estimation of the importance of the examination; often it is merely a bad mental habit.

When you are finally confronted with the questions there are a few more important points to be observed.

(1) *Read All the Questions over Very Carefully Before you Begin to Write.* Be sure that you read

all notes, instructions, and directions given by the examiner. Students are often so excited that they fail to note such important announcements made by the examiner. While you are studying over the questions your nerve is getting settled and you are getting rid of that excitement which is fatal if it continues. In short you plan an attack upon the questions before you begin.

(2) *Plan Out the Time that You Expect to Spend on Each Question.* If there are ten questions and three hours in which to work, you have an average of eighteen minutes to each question. But time must be allowed for revision. Thus it is not wise to let the average run over fifteen minutes per question. Of course, you will spend longer on some than on others. On the whole it is best to give plenty of time to those of which you are sure so as to get the full benefit of your complete answers.

(3) *Attack the Easiest Questions First.* Some students begin with the hard and doubtful ones first so as to get the benefit of mental vigor and freshness. It is doubtful whether this is the wisest thing to do. "A bird in the hand is worth two in the bush." Get the easy ones when you are sure you can. There is such a thing as spending so much time and energy on the harder ones that you will not do yourself justice

on the easier ones. To attack the easier ones first is the *safest* thing to do if not the *best* thing to do.

(4) *If You Cannot Answer a Question Wholly, Put Down what You Know.* It is entirely admissible to leave a question partly answered even though you do not go back and finish it. Some students feel that if they cannot give a fairly complete answer it is better not to attempt the question at all. If the professor does not actually deduct credit for unsuccessful attempts, nothing can be lost. If it is wrong, you are no worse off than if you did not attempt it; if it is right you are that much to the good.

(5) *But Be Careful about "Bluffing" or "Padding" Your Paper.* Some examiners can be bluffed, most of them cannot. Nothing will injure your case quite as much as an attempt to sell for more than you are worth. Padding is worse than bluffing. When you have said all that you know, *quit*, do not start in and say it all over again.

(6) *Be Sure You Understand the Question before You Begin to Write.* Every question is intended to have a point to it; see this clearly before you attempt to answer it. Do not "pretend" to miss the point because you cannot answer it and answer something else not required by the question. It is an old trick to cover up your ignorance on one

point by an excessive display of knowledge on another.

(7) While writing the answer to one question, a hint concerning some other part of the examination may come to you. Do not hesitate to take time out to make note of all ideas as they occur. Sometimes the questions themselves contain bits of valuable information. It often happens that when one question is answered, you have the basis for answering some of the others.

(8) *Do Not Dream over Your Paper.* Some students have the habit of taking long periods of time out for the purpose of leaning back to dream. It is very doubtful if much profound thinking goes on in such periods. On the contrary, mental activity is more often stimulated by bodily activity, especially in such cases where mental activity is difficult to start.

(9) *Be Careful about Inserting Wit or Sarcasm.* Never make the mistake of attempting comedy in an examination paper. Jokes, puns, etc., are entirely out of place. Do not append a note of apology or offer alibis, to the professor. If you feel that you have made a poor showing do not offer any excuse.

(10) *Hand in a Neat, Well-Written Paper.* Such things as handwriting, punctuation, grammar count for more than you might suppose. Even

when the examiner does not count them consciously, they nevertheless exert a kind of subconscious influence on him. He will be prejudiced against a paper that is poorly written; and in favor of one that is neat and clean.

(11) *Be Sure that You Observe All the Rules.* Do what the examiner wants you to do. Write in ink, if he wants it; write only on one side of the paper, if he wants it that way. Find out the rules and follow them.

Chapter XII

WHY STUDENTS FAIL IN COLLEGE

The Frequency of Failure. Statistics show that about one-half the students in college fail in at least one subject in any semester. That is, by taking the grades of a semester it will be found on the average that half the number of persons have failed in at least one subject. We have already indicated that as high as 10 per cent of the freshmen fail out completely at the end of their first semester. Again it has been shown that of those who enter college about 60 per cent graduate. Not all of the 40 per cent who drop out necessarily fail, some withdraw for other reasons; but a high percentage of them do actually fail. The reasons why students fail are truly legion. There are as many reasons as there are failures and more. We can, however, for the sake of convenience group them into eight classes.

(1) Failures Due to Unavoidable Handicaps. We may subdivide these handicaps into Mental, Physical, and Economic. First, some students come

to college mentally unfit. A student may be mentally unfit either because of lack of native intelligence or because of poor high school preparation. The first is by far the more serious. There is a certain type of mind which fits well into the college environment and profits by college training; there are other types of mind wholly unfitted for college work. The slow thinking, slow learning person is always at a serious disadvantage in college. He may do well in certain occupations, he may in fact do very well, and still be unable to succeed in college, no matter how hard he tries. Success in college requires a certain intellectual capacity which if a student does not have he should never attempt college work. Fortunately intelligence tests will measure your intellectual capacity at least roughly. If your intelligence rating is low and if you are having trouble in doing your work, you should seriously consider dropping out of college and taking up some practical work. For sooner or later, you will either fail out or break your health trying to do the work necessary to stay in. The fact that your mental talents are not along academic lines is not a disgrace. There is a common idea that when a student fails out of college because of lack of ability to do college work that he is doomed to a life of manual labor. This is not necessarily the case.

There are different kinds of mental talents. One set of talents is peculiarly fitted for college training; another set may be peculiarly fitted for some other sort of training. We would strongly recommend that early in your college career you submit to a series of psychological examinations for the purpose of determining, in part at least, your mental fitness to remain.

Physical handicaps are less serious than mental because they are less permanent. Of course, there are persons who are constitutionally weak and do not have the strength to stand up under heavy mental work. For mental work does require a surprisingly great amount of physical energy. It is hard to say just what physical handicaps can be included under the heading of "unavoidable." Certainly such diseases as are due to careless exposure should not be. However, such things as poor eyesight, poor hearing, are unavoidable. Persons with very poor eyesight should not attempt college. In thickly populated communities contagious diseases often break out and many students suffer losses of time thereby. The commonest excuse offered at the Dean's office for failure during the semester is illness. The difficulty seems to be that the student loses two or three weeks, perhaps more and attempts to " make it up " so as to

go on with his class. If the block of time lost is too great, no attempt should be made to make it up.

Under economic handicaps come such things as self-support. Making one's way through college is a very popular undertaking. In some colleges and universities a large percentage of the men and women try to earn their way through college. Some attempt to earn all or part of their money. If a student is compelled to earn his way through college, either in part or entirely, he should not attempt to graduate in four years. It is comparatively easy to earn your room and board, but when you try to earn enough money in addition to pay your tuition and other bills you should by no means carry a full load. In spite of all this, self-supporting students do not constitute the bulk of the failures. The fact that they are self-supporting is evidence of their industry, and industry is an important factor in academic success.

So the opposite economic status may be an equal or greater handicap. More students fail because of too much money than not enough. Wealthy parents who supply their sons and daughters with an unlimited amount of spending money forget that it takes time to spend it. This time consumed in getting rid

of their money should be spent in more worthy pursuits! We venture the guess that there is a high inverse correlation between the amount of money a students spends in college and his grades.

(2) Failures Due to Poor Preparation. It is a common complaint that students come to college poorly prepared. Perhaps this should be included among the "unavoidable handicaps." It may be unavoidable but it can be corrected. By poor preparation we mean preparation in the subjects you continue to pursue in college. Take mathematics, for example. Mathematics teachers testify that a great many students fail their college mathematics because they come with an insecure foundation. You cannot hope to excel in college algebra unless you know your elementary and intermediate algebra. The same is true of other subjects. Especially in foreign languages. Students with three years of high school French do not as a rule enter fourth year college French but take instead the third year course. Often this situation occurs: A student will offer three years of Latin for entrance; he is not prepared to take fourth year Latin in college, but does not want to take the third year because since he has offered it for entrance he cannot get the college credit for the

same work; so he takes fourth year Latin and fails. Time and again failures in foreign languages can be traced to the source of poor preparation.

(3) Failures Caused by Lack of Adaptation to College Environment. In Chapter IV the whole question of adjustment to environment was discussed. To make it short, we might say, that many students fail because they do not live up to the advice given in that chapter. We pointed out that there are two kinds of environment, the physical and the social. Failure to become adjusted properly to either may result in disaster. In the first place the question of the proper distribution of time was emphasized. We have statistics to prove that there is a positive correlation between the number of hours per week spent in study and the grades obtained. It stands to reason that other things being equal the more time you spend in study the higher your grades will be. We did not attempt to tell you in Chapter IV how many hours each week you should study in order to pass your work. No rule can be given. It depends on too many other factors, one of which is your intelligence. If you are bright, you can get along with fewer hours of study than if you are dull. This is common sense too. But there is a minimum number of hours below which even the brightest student can-

not drop and still expect to pass. Statistics on some thousand freshmen at one institution show a negative correlation between intelligence and hours of study. This means that the brighter they are the less they study. More common sense, for the more brilliant they are, the less they study. Furthermore, the number of hours you should spend in study depends on how well you know how to study. If you have mastered the technique of study you can "get away" with fewer hours than the student who studies by cumbersome methods.

Another environmental cause of failure is distractions. While we have no supporting figures on distraction, we have every reason to believe that they are responsible for many failures. Students from small towns or rural districts who go to colleges or universities situated in large cities are likely to be greatly distracted by the city itself. The city offers many attractions and allurements to the country boy. It often "throws a spell" over the city boy too. But by far the most deadly distractions are social. In most American universities a student can spend practically every evening at some dance, party or social function. Again without figures to prove it, we believe that there is an inverse correlation between the number of parties a student attends during the year

and the grades he obtains. A limited amount of social life is healthy and to be recommended but carried to excess, as it often is, it means certain failure.

College activities are often the cause of failure. Athletes, for example, have the well earned reputation of standing at the foot of the class. Sometimes this is more the fault of the coaches than of the students. Whoever must practice for the team or with the team all afternoon and sometimes most of the evening has little time for study. Even when he does get time, he is too tired to do good work. Managers, editors, and student officers of every description are usually burdened with so many extras that they have little time for study. The saving feature of this whole situation is that student leaders often have enough intelligence to pass their work with little study. On the other hand, college activities, especially athletics are responsible for a large number of failures.

(4) Failures Caused by Lack of Regulation of Physical Life. Once in a while a student has a physical breakdown and is compelled to leave college. While complete physical wreckage is not common, partial destruction of health is common. In the first place college students sooner or later drift into the habit of staying up late at night. Of course,

many get their quota of sleep by making up for it in the morning. Those who by circumstances are compelled to rise early are always the losers. The result is that many students get an insufficient amount of sleep. It is not our aim here to discuss the mooted question of the minimum amount of sleep required by students. We believe it best to play safe and stick to the old eight hour rule. Again we have no figures to prove how many failures may be traced either directly or indirectly to loss of sleep. Physical directors tell us there are many. It seems reasonable to believe that a student cannot do good mental work while in an impaired state of health.

Then there is the question of eating. While we have no suggestions to offer on the dietary of students, we wish simply to state that both over-eating and under-eating may lead to direful results. Students often eat irregularly. They fit their meals into their schedules. The time of eating is a secondary matter. Also many students over-eat. There is a certain amount and quality of food which is best for mental work. Over-eating results in mental lassitude and sluggishness. Under-eating is less harmful to mental work but is often a cause of physical trouble. Students who have little money will ofttimes starve themselves in order to enjoy other things. A mod-

erate amount of wholesome food taken regularly is sufficient advice to enable you to pass your work in so far as eating affects it.

Physical exercise is an important factor in mental work. Even with enforced gymnasium rules it remains a big problem in student life. Here again the trouble is either too much or not enough. Physical instructors seem to agree that there can be no rule as to the optimum amount of exercise for the well being of the individual student. The amount required depends on so many other factors. We have already noted that the athlete is likely to fail because of too much time spent at physical play, while on the other hand the grind and the recluse may break down and ultimately fail because of not enough.

The use of narcotics is an important factor in determining success or failure, especially tobacco. Numerous experiments have been conducted on the influence of tobacco on mental work. The conclusions reached are that it cuts down mental efficiency from 10 to 50 per cent. While it may be true that tobacco alone never caused the failure of a single student, it is maybe true that it has contributed to the failure of many. It is often the straw that breaks the camel's back. Many schools have collected and published statistics on the grades of smokers and non-

smokers and the non-smokers always come out ahead. Their grades run on the average from 10 per cent to 20 per cent higher. Moreover the percentage of failures is much greater among the smokers than among the non-smokers. Undoubtedly smoking always contributes much to failure and nothing to success.

(5) Failures Due to the Wrong Attitude toward Work. First let us consider some wrong attitudes and see where they lead. Now and then a student gets a "swelled head" and takes the attitude that college work is child's play and that he does not have to work in order to pass. Such students are often bright enough but have an exaggerated notion of their ability. (Incidentally this is a mild form of insanity and may lead to serious results.) It very often happens that the professor finds out who these persons are and fails them just to take them down a little. Usually they fail without any conscious effort on the part of the instructor to aid them in the process.

There is another attitude more deadly than this. It is that of deliberately letting the work drag along in order to avoid being called a "grind." Already in Chapter I we have hung out a red lantern at this point. We made reference to the saying that "C

is a gentleman's grade "; and also to the equally misleading and vicious doctrine "that your studies should not interfere with your college education." It is not the slogans that we object to but the attitude they reflect. The student who maliciously and deliberately neglects and disdains all intellectual work in order to gain social prestige usually loses out all the way around. In the first place his chances of remaining in college are about one in a hundred and even if he is lucky enough to remain he becomes a "laughingstock" rather than a "Social Lion."

Another attitude that results in certain failures is that of regarding your studies as "necessary evils" to be passed in order to be eligible. All institutions have certain "eligibility rules" which are simply statements as to the minimum amount of work required before the student can take part in activities or be initiated into a fraternity or sorority. Students who take this attitude toward their work are always in trouble, — while they remain. Fortunately, for them, they soon earn enough "E's" and "F's" to entitle them to a certificate of discharge. Their difficulty is that of running on too slim a margin.

More common and more dangerous than either of the above is the attitude of regarding your work as

something "imposed" upon you by your instructors. This attitude is reflected in the tendency of nearly all students to escape as much knowledge as possible in college. It is also manifested in the tendency to leave a few days early for all vacation periods and return a few days late. It is an amazing paradox that students will come to college, pay their money, spend their time and still do almost anything to cheat themselves out of their money's worth. This is a peculiar weakness of American university students. What would happen if there were no daily recitations, no weekly quizzes, no checks on assigned work, no penalties for absence? The failures at the end of the semester would be far greater, — perhaps in excess of the passes. At least this is the opinion of many faculties else no such regulations would be enforced. In spite of these rules and their rigid enforcement, many students fail because of this attitude.

(6) Failures Due to Lack of Interest in Work. All the way through this chapter we have been careful to keep separate facts and opinions, stating each time when we had statistics to back up our statements even though the actual figures were not given. The reason for not giving the figures in detail is simply to avoid boring the reader with them. Here is another case where there are plenty of facts to sup-

port the statement that interest and achievement in intellectual work are highly correlated. There are all degrees of interest in college subjects, ranging from enthusiasm at the top to a positive ennui or distaste at the bottom. If you are exceedingly interested in a subject to the extent of being enthusiastic over it, your chances of a high grade in it are good, other things being equal, and vice versa. By "other things" we mean intellectual ability, attitude, health, application, etc.

In addition to statistical studies showing that lack of interest results in failure, there are some common observations which bear out the same conclusion. In the first place failures are more prevalent in "required" courses than they are in electives. We have already mentioned the fact that when a student avoids a subject in high school he is required to take it in college, simply because it leaves a gap in his education. This means that "required" courses are filled up with students who are disinterested in them, or even have a distaste for them. The result is a high rate of mortality. Of course, this depends on the nature of the course, the personality of the teacher, etc. — perhaps we should add, "other things being equal."

Another factor is that many students have a pre-

conceived idea that they lack the specific ability required to pass a certain course. For example, students offer as an excuse for failure in mathematics that they lack mathematical ability, or for failure in language that they lack linguistic ability, and for science that they lack the native traits required to do successful laboratory work. It is true that there are native aptitudes which greatly aid in studying specific subjects, but these traits show themselves more in the higher branches, than in the general treatment received by the subject in an ordinary college course. But this is not the point. Whether the student has the ability or not he will fail if he thinks it is lacking, and he will increase his chances of passing if he thinks he can. It all amounts to this, if you think you are going to fail in spite of anything you might do, then you will fail; if you think you can pass by virtue of hard work, you may pass. Remember the proverb: "He can who thinks he can."

Another common cause of failure is the tendency to regard as impractical and useless, subjects that are difficult to master. "This will never do me any good, so why study it" is a very common mistake. The percentage of failures in the disciplinary and cultural courses are far greater than in the so-called "bread and butter" courses. In most colleges the

science courses claim the greatest percentage of failures, the language courses next, and the social sciences next. This is not always the case, for much depends on the severity of the grading.

(7) Failures Due to Poor Methods of Study. The major part of this volume is devoted to the discussion of general and specific methods of study. We have endeavored to point out the difference between effective and ineffective mental work, so that you will be able to improve. Here we wish to say the same thing over again but from the opposite or negative point of view. Some of the things to be avoided as leading to failure in study are the following.

(*a*) *Dawdling over Your Lessons.* This is an old grammar school habit which some college students never break. It is the habit of spending from two to three times as long on a lesson as is necessary. True enough, haste makes waste, but not always. There are two ways of hurrying without making waste. First, drop all irrelevant matters for the time being and stick to the relevant. Each lesson has its main ideas and a number of subsidiary ideas; the student will often waste his time taking in these mental side shows. The irrelevant being often interesting will lead you astray into the byways and

hedges and some may lead you into blind alleys. The second method of saving time is to prepare and follow a time schedule as suggested in an earlier chapter.

(*b*) *Trying to Do Too Many Things at Once.* Students often have so many irons in the fire that some of them are certain to get burned. Mental efficiency demands that you do not attempt to do more than one thing at a time and while doing it concentrate all your energies on it. The task just completed should not remain in mind and the task just ahead should not be anticipated.

(*c*) *No System of Study.* Many students drift into the habit of studying only when they feel like it. The specific methods employed are hit-or-miss, trial and error. The lack of a study system need not in itself be the cause of failure but when teamed with other hindrances may contribute to it.

(*d*) *Inability to Read.* In the chapter on Reading we have noted the fact that many college students are poor readers. Whatever the causes of this may be the fact remains that it helps swell the ranks of the failures. By reading is meant comprehension of the material on a printed page and not merely pronouncing words. One good way to improve in this respect is to practice reading difficult material and

hold yourself to the task of reproducing it in your own words.

(*e*) *Poor Methods of Memorizing.* Notice we do not say "poor memory." The fact that nearly every examination requires a knowledge of the subject, seems reasonable to suppose that failure to pass an examination can be traced to ignorance of the facts. This may not be the case since it is possible to know the facts and still fail the examination. Yet statistics show that students who have memorized the material stand a good chance of passing, while those who trust to luck or to their general ability stand an equally good chance of failing.

(*f*) *Other Causes.* Here we may include failure to organize knowledge, failure to think straight, and so on. Indeed, the cause of your failure may be any one of a large number of factors involved in how to study.

(8) Miscellaneous Causes of Failure. In attempting to classify the causes of failure, we find left over an assorted group of factors which we lump together under miscellaneous.

(*a*) *A Late Start.* A Physics professor testified that a large percentage of the students who failed elementary Physics, had a bad start. It is almost impossible to enter a Physics class a week or so late and

ever catch up. This seems to be true for all courses requiring laboratory work. When the work missed can be made up at the student's leisure and in his own room, late registration is not so serious a handicap.

(*b*) *The Lack of Will-Power.* There is an abnormal state of mind known to psychologists as "aboulia." In its extreme form it is characterized by total inactivity or loss of "pep." All ambition, enthusiasm, zest for action are gone. On the surface it looks much the same as just old-fashioned laziness but careful analysis shows that it is a form of mental disease which is deep-seated and hard to cure. The milder forms of this disease are prevalent among students. Its major symptoms are procrastination (putting things off), dilly-dallying around, and finding excuses for not getting down to work. Such patients plan their work with the noblest intentions, devise elaborate systems of study, work out beautiful time schedules, and make all the necessary preparations for excellent study; but when it comes to putting these into execution they somehow never get it done. With them "to study or not to study" is the ever perplexing question. Whether they will endure the pains and hardship of an hour with their books or like Hamlet "opposing end them" is the eternal source of diffi-

culty. Unless this disease is diagnosed and treated in time, the student invariably fails out of college.

(*c*) *Unwilling to Pay the Price.* Too many students are looking for an easy road to the Bachelor's degree. When Euclid was teaching Ptolemy geometry it is said that Ptolemy's mind was taxed too heavily so that he asked his teacher to show him an easier way, and Euclid replied, "there is no royal road to geometry." True enough, and there is no royal road to anything else that is worth while in life. If you wish success in college, if you want high marks and many of them, you must pay the price. You cannot buy knowledge, you cannot depend on others to carry you through. You may ride through a course in foreign language on a "pony" (a translation) and "get away with it" for the time being but you will never earn a degree by such tactics. One very common cause of failure in college is the habit of depending on others to do your work. At one of the Army training camps during the war, there was a motto printed at the top of each page of lectures which all students might well adopt: "Do It Well, Do It Cheerfully, Do It Now."

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